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THE JOURNAL OF THE AMERICAN OSTEOPATHIC ASSOCIATION

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CONTENTS, NOVEMBER, 1945

ORIGINAL ARTICLES—
Observations on the Treatment of Hypermotile Joints by Injection. B. B. Bahme, B.S., D.O., Dubuque, Iowa....101
Use of Respiratory Movement As an Aid in the Correction of Osteopathic Spinal Lesions. H. V. Hoover, B.S., D.O., Tacoma, Wash....109
Roentgen Diagnosis and Treatment of the Atypical Pneumonias. Byron L. Cash, D.O., Des Moines, Iowa....111
Certain Supravital Microscopic Studies of the Heart. Louisa Burns, D.O., M.Sc. Los Angeles....113
Review of Cardiac Pathology in Certain Laboratory Animals. Louisa Burns, D.O., M.Sc., Los Angeles....115
EAR, EYE, NOSE AND THROAT SUPPLEMENT
Editorials:
The O.C.O.O. Will Meet in Philadelphia in 1946. C. Paul Snyder, D.O., Philadelphia....119
Message from Our Secretary-Treasurer. L. S. Larimore, D.O., Kansas City, Mo. 119
Dr. Charles M. LaRue Dies Suddenly. T. J. Ruddy, D.O., Los Angeles....119
Articles:
Sphenoid Sinus—Principles of Treatment. Walter V. Goodfellow, D.O., Hollywood, Calif....120
Arteriosclerotic Retinopathy. Antonio Abeyta, D.O., Philadelphia....123
Acute Nasal Pathology. C. M. Mayberry, D.O., East Liverpool, Ohio....124
An Observation. C. M. Mayberry, D.O., East Liverpool, Ohio....127
Diagnosis and Surgical Treatment of Strabismus. Laurence Houts, D.O., Long Beach, Calif....128
Prevention and Treatment of Foreign Bodies in the Tracheobronchial Tree. J. Ernest Leuzinger, D.O., M.Sc. (Ost.), F.O.C.O., Philadelphia....130
Intranasal Examination and Conservative Treatment. Ralph S. Licklider, D.O., F.O.C.O., Columbus, Ohio....131
A Tumor of the Lacrymal Gland. Antonio Abeyta, D.O., Philadelphia..132
Diseases of the Middle Ear. C. Paul Snyder, D.O., F.O.C.O., Philadelphia....133
The Diagnostic Significance of Visual Field Findings. F. W. Paul, D.O., Detroit....135
Multum in Parvo. T. J. Ruddy, D.O., D.Sc.O., F.O.C.O., Los Angeles....137
Toxic Amblyopia. C. E. Nordstrom, D.O., Carthage, Mo....138
EDITORIALS—
Wound Healing. Leonard V. Strong, Jr., D.O., New York....139
Funds for Educational Advance....139
New York City, 1946....140
DEPARTMENT OF PROFESSIONAL AFFAIRS—
Advisory Board for Osteopathic Specialists....141
Committee on Special Membership Effort....141
DEPARTMENT OF PUBLIC RELATIONS—
Condensed Questions and Answers on Selective Service Procedure....142
Occupational Classification Other Than Agriculture and Merchant Marine....143
Bills in Congress....145
ORTHOPEDICS—
The Treatment of Fractures by the General Practitioner. M. O. Johnson, D.O., Traverse City, Mich....146
CURRENT MEDICAL LITERATURE....147
CURRENT OSTEOPATHIC LITERATURE....149
BOOK NOTICES....150
CONVENTIONS AND MEETINGS....ad. p. 41
STATE BOARDS....ad. p. 47

SUBJECT INDEX

Abeyta, Antonio:
Arteriosclerotic retinopathy....123-OCOO
A tumor of the lacrymal gland....132-OCOO
Alcohol . . . or alcoholism, [Miller]
....ad p. 53-Ex.
Amblyopia, toxic, [Nordstrom]....138-OCOO
American Osteopathic Association: See also Meetings; Membership
Committee on Public Health, correction....140
Armed Forces: See also Selective Service
bills in Congress relating to draft and discharge....142-Pu.R
Arteriosclerotic retinopathy, [Abeyta]
....123-OCOO
Bahme, B. B.:
Observations on treatment of hypermotile joints by injection....101*
Becker, Katherine:
Current medical literature....147-CML
Book Notices:
Clinical Traumatic Surgery. John J. Moorhead....150-BN
A Manual of Surgical Anatomy. Tom Jones and W. C. Shepard....150-BN
An Introduction to Medical Science. William Boyd....150-BN
Fundamentals of Pharmacology. Clinton H. Thienes....150-BN
The Management of Obstetrics. Paul Titus....150-BN
Public Medical Care; Principles and Problems. Franz Goldman....151-BN
Public Welfare Directory. Howard L. Russell, Ed....151-BN
Physical Diagnosis. Ralph H. Major
....151-BN
A Textbook of Ophthalmology. Sanford R. Gifford....151-BN
Jurisprudence for Nurses. Carl Scheffel and Eleanor McGarvah....151-BN
National Health Agencies. Harold M. Cavins....151-BN
A Synopsis of Medicine. Sir Henry Letheby Tidy....152-BN
Athletic Injuries: Prevention, Diagnosis and Treatment. Augustus Thorndike
....152-BN
Rypin's Medical Licensure Examinations. Walter L. Bierring, Ed....152-BN
The Dietary of Health and Disease. Gertrude I. Thomas....152-BN
Books Received....ad p. 50
Burns, Louisa:
Certain supravital microscopic studies of the heart....113*
Review of cardiac pathology in certain laboratory animals....115*
Cash, Byron L.:
Roentgen diagnosis and treatment of the atypical pneumonias....111*
Cataract surgery, [Ruddy]....137-OCOO
Chandler, Louis C.:
Professional recognition and specialty certification....141-Pr.A
Children:
emotional aspects of convalescence, [Senn]....ad p. 63-Ex.
social security for, [McHugh]....ad p. 48-Ex.
Colds:
acute nasal pathology, [Mayberry]
....124-OCOO
Collens-Wilensky test, [Costello and Costello]....152-Ex.
Colleges, Osteopathic:
funds for educational advance, [Hulburt]....139-E
Convalescence, emotional aspects of, [Senn]....ad p. 63-Ex.
Current medical literature....147-CML
Current osteopathic literature....149-COL
Directory, A.O.A., 1946 deadline approaches. [Gibbs]....141-Pr.A
Ear, middle, diseases of, [Snyder]..133-OCOO
Emotional aspects of convalescence, [Senn]....ad p. 63-Ex.
Ethmoid sinus, [Mayberry]....127-OCOO
Eyes: See also Amblyopia; Cataract; Lacrymal gland; Retinopathy
diagnostic significance of visual field findings, [Paul]....135-OCOO
in ethmoid sinus disturbances, [Mayberry]....127-OCOO
inflamed, diagnosis of, [Gillette]....149-COL
Foreign bodies, prevention and management in tracheobronchial tree, [Leuzinger]....130-OCOO
Fractures, treatment by general practitioner, [Johnson]....146-Orth
Gibbs, Stephen B.:
1946 Directory deadline approaches.
....141-Pr.A
Goodfellow, Walter V.:
Sphenoid sinus—principles of treatment
....120-OCOO
Hand, treatment of soft-tissue injuries
....ad p. 52-Ex.
Heart:
review of pathology in certain laboratory animals, [Burns]....115*
supravital microscopic studies, [Burns]..113*
Hemorrhoids, internal, evaluation of injection, [Dudley]....149-COL
Hoover, H. V.:
The use of respiratory movement as an aid in the correction of osteopathic spinal lesions....109*
Houts, Laurence:
Diagnosis and surgical treatment of strabismus....128-OCOO
Hulburt, Ray G.:
Funds for educational advance....139-E
New York City, 1946....140-E
Hypertension, and cataract surgery, [Ruddy]....137-OCOO
Hysterical wry-neck of soldiers, [King]
....149-CML
Injection treatment of hypermotile joints, [Bahme]....101*
Intervertebral Discs: See also Nucleus Pulposus
herniated, [Denslow]....149-COL
cervical, lesions of, [Browder and Watson]....147-CML
Johnson, M. O.:
Treatment of fractures by the general practitioner....146-Orth.
Joints, hypermotile, treatment by injection, [Bahme]....101*
Lacrymal gland, tumor, [Abeyta]....132-OCOO
Larimore, L. S.:
Message from our secretary-treasurer
....119-OCOO
LaRue, Dr. Charles M., dies suddenly [Ruddy]....119-OCOO
Legal and Legislative:
bills in Congress....145-Pu.R
Lesion, Osteopathic:
cardiac pathology in certain laboratory animals, [Burns]....115*
certain supravital microscopic studies of the heart, [Burns]....113*
respiratory movements as aid in correction of spinal lesions, [Hoover]....109*
Leuzinger, J. Ernest:
Prevention and management of foreign bodies in the tracheobronchial tree
....130-OCOO
Licklider, Ralph S.:
Intranasal examination and conservative treatment....131-OCOO
Ligamentous contraction, fascial, release in physical rehabilitation, [Billig]....148-CML
Lymphosarcoma, [Frazer]....150-CML
Mayberry, C. M.:
Acute nasal pathology....124-OCOO
An observation....127-OCOO
Meetings:
A.O.A. meeting in New York, 1946, [Hulburt]....140-E
announcements....ad p. 41
O.C.O.O. will meet in Philadelphia in 1946....119-OCOO
Membership, A.O.A.:
changes of address and location....ad p. 67
applications for membership....ad p. 71
honor roll....141-Pr.A
Nordstrom, C. E.:
Toxic amblyopia....138-OCOO
Nose:
acute pathology, [Mayberry]....124-OCOO
intranasal examination and conservative treatment, [Licklider]....131-OCOO
Nucleus pulposus, herniated, advances in diagnosis and treatment, [Chapman]
....149-COL
Osteopathic College of Ophthalmology and Otorhinolaryngology:
committees....118-OCOO
message from our secretary-treasurer, [Larimore]....119-OCOO
supplement contributed by....117-OCOO
will meet in Philadelphia in 1946, [Snyder]....119-OCOO
Osteopathic Progress Fund:
funds for educational advance, [Hulburt]....139-E
Paul, F. W.:
The diagnostic significance of visual field findings....135-OCOO
Pneumonia, atypical, roentgen diagnosis and treatment, [Cash]....111*

(Continued on page 152)

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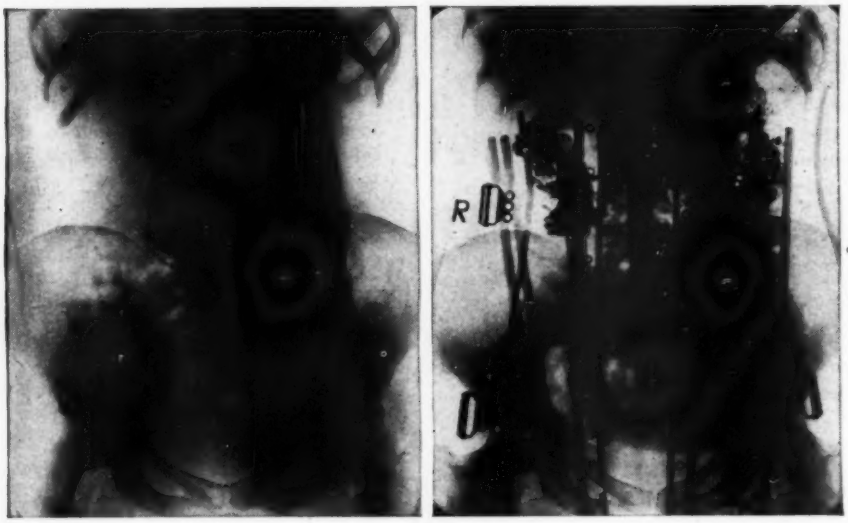

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Frisch, A. W.; Behr, B.; Edwards, R. B., and Edwards, M. W.: Am.J.Syph., Gonor.&Ven. Dis. 28:627 *(Sept.)* 1944.

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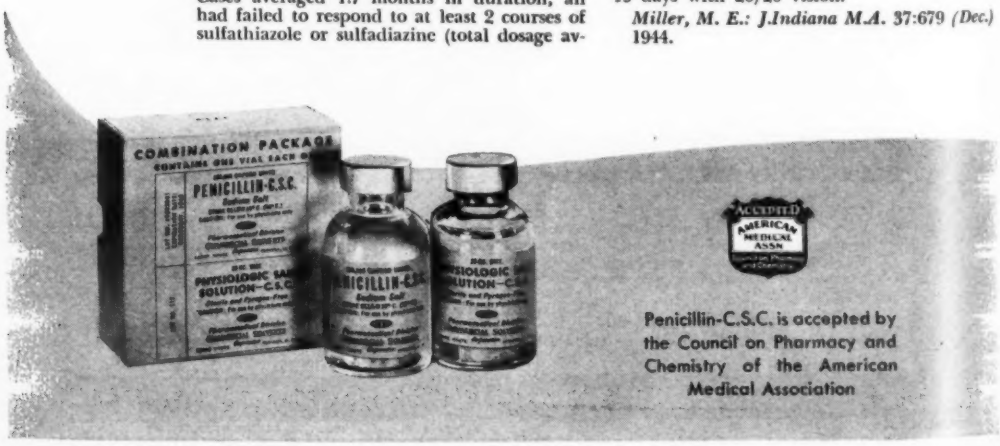
Miller, M. E.: J.Indiana M.A. 37:679 *(Dec.)* 1944.



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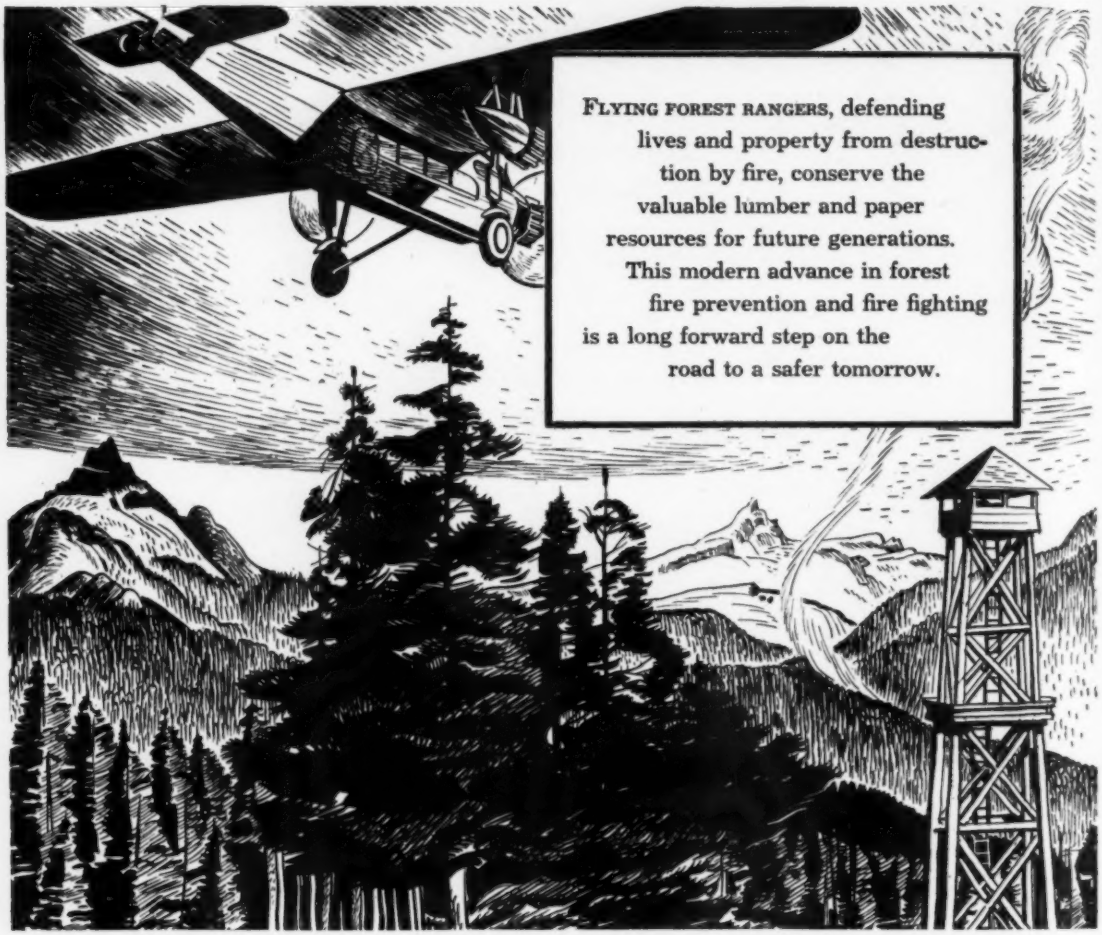

FLYING FOREST RANGERS, defending lives and property from destruction by fire, conserve the valuable lumber and paper resources for future generations. This modern advance in forest fire prevention and fire fighting is a long forward step on the road to a safer tomorrow.

To today's generation, as well as to the rising generation, Lanteen Medical Laboratories present another notable example of advanced thought and planning—Lanteen products, leaders in their field, produced under rigid scientific standards.

Since patients are not mechanically minded, simplicity and ease of handling are prime requisites for continued use. Lanteen Flat Spring Diaphragm is extremely simple to place—it is collapsible in one plane only. No inserter required. Distributed ethically—advertised only to the medical profession—available only upon the recommendation or prescription of a physician. Complete information upon request.

L A N T E E N

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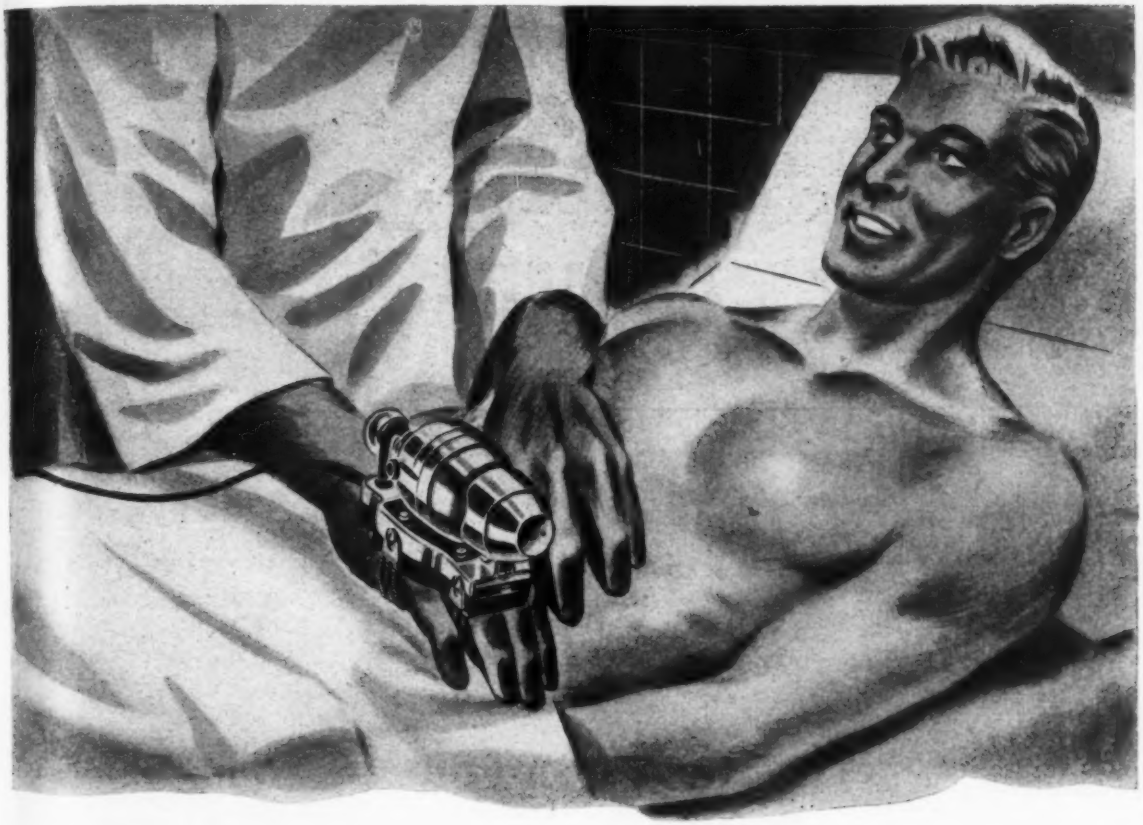


℞ MASSAGE

with the Oster MASSAGE INSTRUMENT

Cushioned on the back of your hand, the Oster Massage Instrument is a helpful adjunct in daily practice. Its use brings about more quickly a state of relaxation and thus facilitates corrective treatment. It is of great value for stimulating circulation; for the lymphatic pump; for sprains, fractures, and dislocations; for many other conditions amenable to massage.

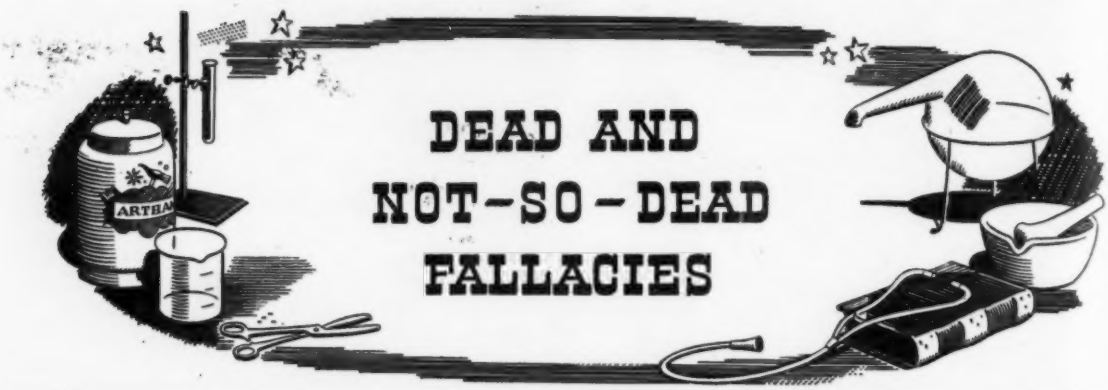
Oster's patented Suspended Motor Action imparts rotating-patting movements to your fingertips, for application appropriate to each treatment — mildly soothing or deeply penetrating. The patented Stroke Control regulates the depth of the massage movement.

Oster Massage Instrument will be available soon. Ask your dealer to keep you informed.

"A Resumé of Massagic Therapy" presents a concise, accurate picture of the treatment of certain disease conditions which are amenable to massage therapy — a ready reference for the busy practitioner. There's a copy ready for mailing to you without obligation. Please request it on your letterhead.

N-9

JOHN OSTER MFG. CO., Dept. 311, Racine, Wisconsin



USNEA, THE NAME FOR THE MOSS SCRAPED from the skull of a deceased criminal, was an 18th Century "cure-all." The physician applied it to the patient's skin with a piece of rope with which the criminal had been hanged.

TODAY SOME FOLKS STILL believe that once a can of food is opened it should be emptied immediately into a porcelain container. Otherwise it becomes poisonous, they say. Perhaps you have heard this fallacy many times.

Says the Department of Agriculture: "It is just as safe to keep canned food in the can it comes in as it is to empty the food into another container. The principal precautions for keeping food are — keep it cool and keep it covered."

CANCO

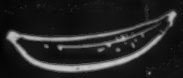
AMERICAN CAN COMPANY

230 PARK AVENUE • NEW YORK 17, NEW YORK

WORLD'S LARGEST MANUFACTURERS OF FIBRE AND METAL CONTAINERS

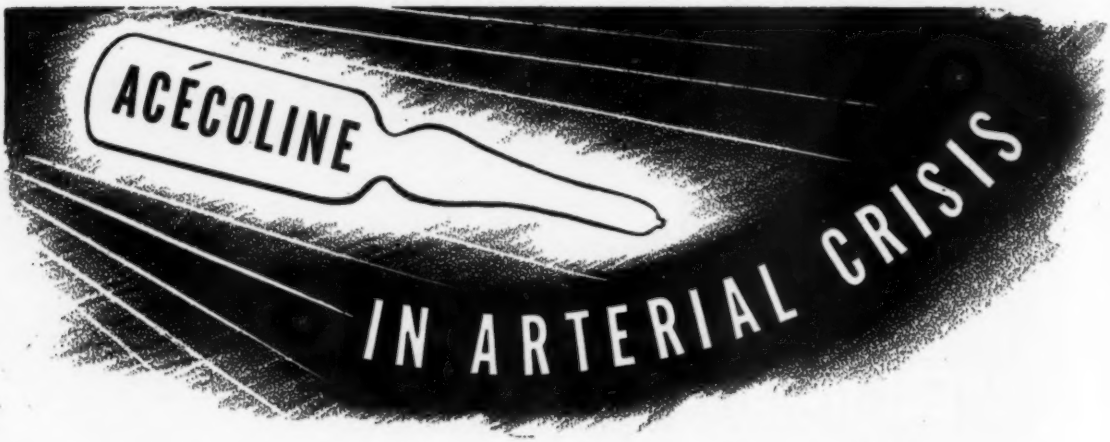
SUGAR

FROM THE FRUIT BOWL

Eat fruits to save sugar. A  is one of the sweetest fruits. It is at its sweet, digestible best when it is fully ripe. You can tell it is fully ripe when its yellow peel is flecked with brown. A fully ripe banana gives you the equivalent of five teaspoons of sugar.

Do not put bananas in the refrigerator — they ripen best at room temperature.

UNITED FRUIT COMPANY



A single 100 mg. ampoule of ACÉCOLINE may often suffice to meet an emergency in acute peripheral arterial spasm, especially when associated with hypertension.

ACÉCOLINE employs the identical substance, acetylcholine, which the body expends to mediate nerve impulses, interruption of which precipitates arterial crisis.

ACÉCOLINE is correspondingly effective in allied conditions, such as Raynaud's disease, endarteritis obliterans, intermittent claudication, diabetic and senile gangrene, varicose ulcers and certain tachycardias.

ACÉCOLINE is always ready for emergency use without diluents. It is sterile, indefinitely stable and non-toxic.

Professional literature on request.

Dosage

100 to 200 mg. twice daily, up to 15 injections per course. Intramuscular or subcutaneous, never intravenous. Available in 20, 50, 100 and 200 mg. strengths of acetylcholine hydrochloride per 1 cc. ampoule. Boxes of six. All ampoules contain 40 mg. of anesthetic salicyl alcohol (saligenin) and propylene glycol q.s. Contraindicated in asthma, bradycardia and coronary disease.

ACÉCOLINE
IN ARTERIAL CRISIS

ANGLO-FRENCH LABORATORIES, Inc.
75 VARICK STREET • NEW YORK 13, N. Y.

HOW TO PROTECT YOUR HANDS

Frequent washings leave hands dry and scaly... etch tiny fissures in the skin where harmful organisms can gain entrance.

TRUSHAY, applied *before* washing, forms an invisible film which helps guard against the harsh effects of cleansing agents . . . helps protect hands by aiding to keep skin normal and unbroken!

TRUSHAY does not cause unnatural stickiness

Trushay THE "BEFOREHAND" LOTION

A Product of BRISTOL-MYERS COMPANY, 19NJ, W. 5th St., New York 20, N. Y.

Notable is the fact that *all* of the reports on the use of this systemic type of therapy in sizable groups of chronic arthritics specify Ertron.

The results of these clinical investigations are results obtained with Ertron, and there is no identical product which may be substituted for it.

The following bibliographic references apply only to Ertron in the systemic treatment of arthritis.

Published reports on ERTRON in Arthritis

ERTRONIZE THE ARTHRITIC

Ertronize Means: Employ Ertron in an adequate daily dosage over a sufficiently long period to produce optimal results. Gradually increase the dosage to that recommended or to the toleration level. Maintain this dosage until maximum improvement occurs. Ertron alone—and no other product—contains electrically activated vaporized ergosterol (Whittier Process).

Supplied in bottles of 50, 100 and 500 capsules.
Parenteral for supplementary intramuscular injection.

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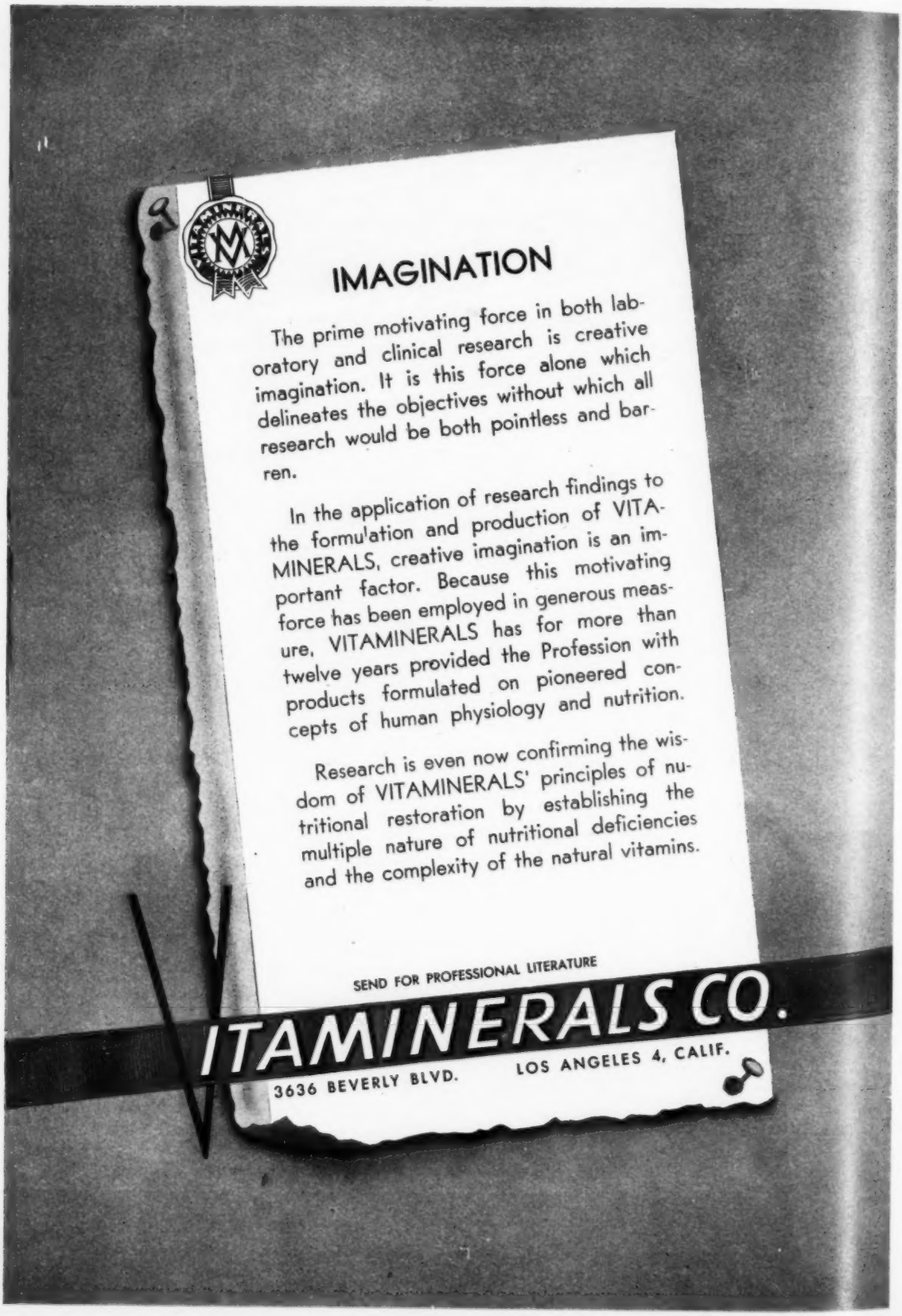
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In the application of research findings to the formulation and production of VITAMINERALS, creative imagination is an important factor. Because this motivating force has been employed in generous measure, VITAMINERALS has for more than twelve years provided the Profession with products formulated on pioneered concepts of human physiology and nutrition.
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Not Merely

ISOLATED NUTRIENTS

Essential though they are, vitamins are nevertheless not the only nutrients which may be lacking in the diet of persons physically below par. Nutritional imbalance, not infrequently the cause of poor physical stamina, excessive irritability, and poor appetite, may be attributable to other dietary-induced deficiencies. In consequence, adjustment of the entire nutritional intake is indicated.

Virtually any diet can be enhanced to a point of adequacy through the addition of three glassfuls of Ovaltine daily. Made with milk as directed, this delicious food drink supplies liberal quantities of most essential nutrients, as indicated by the table below. Qualitatively Ovaltine is equally valuable; it provides biologically adequate protein, readily assimilated and utilized carbohydrate, well emulsified fat, B complex and other vitamins, as well as essential minerals. Ovaltine proves advantageous both as a mealtime beverage and a between-meal snack. Its low curd tension insures rapid gastric emptying, hence it does not interfere with the appetite for the next meal.

THE WANDER COMPANY, 360 N. MICHIGAN AVE., CHICAGO 1, ILL.

Ovaltine

Three daily servings of Ovaltine, each made of ½ oz. Ovaltine and 8 oz. of whole milk,* provide:

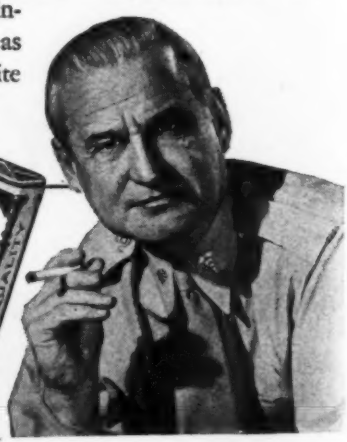
PROTEIN	31.2 Gm.	VITAMIN A	2953 I.U.
CARBOHYDRATE	62.43 Gm.	VITAMIN D	480 I.U.
FAT	29.34 Gm.	THIAMINE	1.296 mg.
CALCIUM	1.104 Gm.	RIBOFLAVIN	1.278 mg.
PHOSPHORUS	.903 Gm	NIACIN	7.0 mg.
IRON	11.94 mg.	COPPER	.5 mg.

*Based on average reported values for milk.

DOCTOR *of the Purple Heart!*

The Purple Heart—awarded to persons wounded in action against the enemy

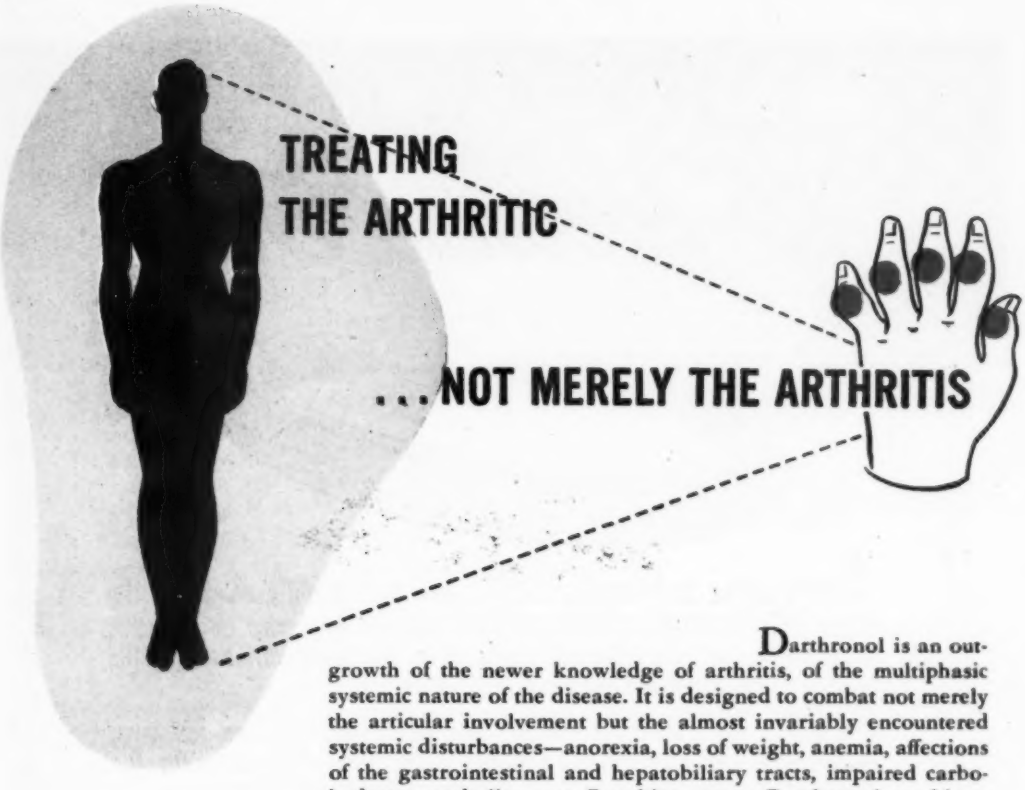
THE GUNS are silent once more. For the men with the guns, the war is over. But for the thousands of medical men in the service, the war still goes—their "war in white" in behalf of the wounded, the wearers of the Purple Heart. Doctors that they are, of medicine and morale, they well know how much a cigarette can mean to an invalid soldier. And servicemen that they are, as well, these doctors know what a big favorite Camels have been, and are, with men in all the services.



Camels

COSTLIER TOBACCOS

R. J. Reynolds Tobacco Company, Winston-Salem, North Carolina



TREATING THE ARTHRITIC

...NOT MERELY THE ARTHRITIS

Darthronol is an outgrowth of the newer knowledge of arthritis, of the multiphasic systemic nature of the disease. It is designed to combat not merely the articular involvement but the almost invariably encountered systemic disturbances—anorexia, loss of weight, anemia, affections of the gastrointestinal and hepatobiliary tracts, impaired carbohydrate metabolism, etc. For this purpose Darthronol combines, in a single capsule, massive dosage of vitamin D_2 and adequate potencies of the other eight vitamins concerned with the functional capacity of numerous organs and the integrity of vital processes affected in arthritis. An added advantage is that the amounts of each vitamin in the capsule are automatically increased in a constant ratio, when severity of the disease demands more intensive therapy with vitamin D_2.

The second edition of the brochure "Systemic Therapy in the Arthritides" is now available. Physicians are invited to send for a copy.

J. B. ROERIG & COMPANY
536 Lake Shore Drive • Chicago 11, Illinois

Each Capsule Contains:

Vitamin D (Irradiated Ergosterol)	50,000 U.S.P. Units
Vitamin A (Fish-Liver Oil)	5,000 U.S.P. Units
Ascorbic Acid	75 mg.
Thiamine Hydrochloride	3 mg.
Riboflavin	2 mg.
Pyridoxine Hydrochloride	0.3 mg.
Calcium Pantothenate	1 mg.
Niacinamide	15 mg.
Mixed Natural Tocopherols	3.4 mg.

(Equivalent in biological activity to 3 mg. of Alpha Tocopherol)

DARTHRONOL *for the Arthritic*

a* ROERIG *Preparation

There is no *Universal Size*

THERE never has been a wedding ring that would correctly fit the finger of all women . . . and there is no universal size of occlusive diaphragm that will correctly conform to the many variations of the vaginal and cervical structures.

Competent clinical investigation has established that an occlusive diaphragm must be of individually correct size in order for the cervix to be properly protected against entrance of spermatozoa.

Because of the variance in the vaginal anatomy of individual patients the correct size can be determined only through measurement by a properly qualified physician.

To insure closer, more accurate fitting with greater comfort for your patients, specify "RAMSES"* Flexible Cushioned Diaphragm on your prescriptions.

Ramses FLEXIBLE CUSHIONED DIAPHRAGMS

ACCEPTED AMERICAL MEDICAL ASSN.

are made in gradations of 5 millimeters in sizes ranging from 50 to 95 millimeters inclusive . . . available through any recognized pharmacy.

* The word "RAMSES" is the registered trade mark of Julius Schmid, Inc.

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for infants

Biolac—Closely resembles human milk in digestibility and nutritional completeness (vitamin C is the only supplement needed). Indeed, Biolac is "baby talk" for a good square meal.

DRYCO—Designed for formula flexibility, Dryco can be used with or without carbohydrates. High-protein low-fat ratio makes it ideally suited to normal as well as "special" infant feeding cases.

MULL-SOY—An emulsified hypoallergenic soy-bean food, clinically established as an excellent cows' milk substitute for both infants and adults. Mull-Soy (1:1) closely approximates cows' milk in nutritional values of protein, fat, carbohydrates and minerals.

KLIM—Powdered whole milk of superior quality. Because of its soft curd characteristics, Klim is particularly adaptable in infant feeding, in peptic ulcer dietotherapy, and in other special diets.

Beta-Lactose—This improved milk sugar is five times more soluble than alpha lactose, and much more palatable. Ideal for formula modification!

Borden's prescription products are available at drug stores everywhere. Complete professional information may be obtained upon request.

BORDEN'S PRESCRIPTION PRODUCTS DIVISION

350 MADISON AVENUE NEW YORK 17, N. Y.

SOLIDS *and* LIQUIDS

of canned foods measured in research project at 5 great American Universities on basis of relative*

NUTRITIONAL VALUES

**Detailed report published in the August 10th, 1944, issue of THE JOURNAL OF NUTRITION*

Part of the research project mentioned was conducted for the purpose of obtaining information about the distribution of nutritive values between the solid and the liquid portions of different canned vegetables and fruits. A fair picture of such distribution could be obtained, it was decided, by determination of three of the water-soluble vitamins; namely, ascorbic acid, thiamine, and riboflavin.

This advertisement presents the conclusions reached by observations regarding the over-all distributions. Detailed information on specific canned foods is in the complete report, as noted above.

(1) In the canned vegetables studied,* the solid weights were 48–73% of the total can contents. The ascorbic acid content of the solids was 46–68% of the total; the thiamine was 53–72%; the riboflavin was 57–82%. In each case, that is, the amounts of ascorbic acid and of thiamine were proportional to the amounts of solids; while the amounts of riboflavin were just slightly higher in the solids.

(2) In the canned fruits studied,** the solid weights were 46–67% of the total can contents. The ascorbic acid content of the solids was 49–68% of the total; the thiamine was 50–70%; the riboflavin was 53–69%. Thus in the fruits also the amounts of ascorbic acid and of thiamine were proportional to the amounts of solids, with the amounts of riboflavin slightly higher in the solids.

This information is of practical dietetic importance, for it establishes the fact that liquid portions of canned vegetables and fruits have, in general, about the same proportionate vitamin content, by weight, as do the solids. It therefore *stresses* the value of education along lines of serving the liquid. And it emphasizes the worth of the canning process, which preserves for the consumer *all* the nutrient-laden liquid in which the food is cooked.

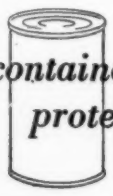
As a reader of this publication, you play an important part in helping to form public dietary habits. We urgently request your support in disseminating information regarding the good values of canned foods in supplying nutrition at low cost. To that end, an interesting booklet has been prepared in lay language. Upon your request, we shall be happy to send one or more copies for your use. Please address:

**Asparagus, green beans, lima beans, carrots, corn, peas, and spinach—each from the same pack.*

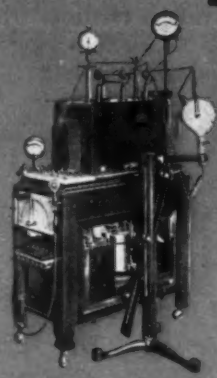
***Apricots, grapefruit, peaches, pears, pineapple, and Italian prunes—each from the same pack.*

CAN MANUFACTURERS INSTITUTE, INC., 60 EAST 42nd ST., NEW YORK 17, N. Y.

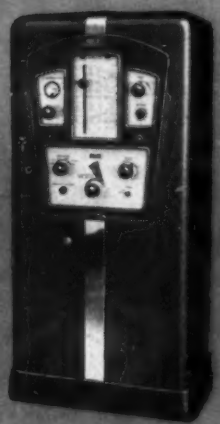
No other container protects like the can



A Salute TO ROENTGEN... and a PLEDGE for the FUTURE



As early as 1905 Keleket perfected this "Grosse Flamme" X-ray coil, so called because it "drew a flame of 12 inches" when other coils produced but a few inches of spark.



The KELEKET Tochron with its many patented features, is acknowledged to be the greatest advancement in X-ray control units in the entire field of X-ray. There is nothing that compares with the Tochron Control!

IT is now 50 years since Wilhelm Konrad Roentgen discovered the X-ray. From this discovery came a great new instrument of medicine—the means of saving thousands of human lives.

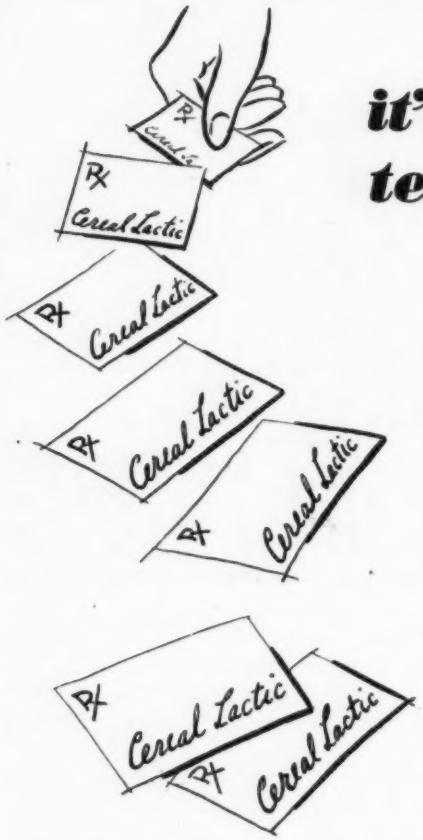
But the X-ray of today is very different from the X-ray of Roentgen's period. For 50 years, it has been improved—refined—perfected. To all those who have carried on the work of Roentgen, credit is also due.

KELEKET, oldest company continuously in X-ray, was in business within five years of Roentgen's discovery. KELEKET and X-ray grew up together. And KELEKET pioneered the way through the crude apparatus of the early 1900's, just as it leads the way in the splendid equipment of today.

In saluting the achievement of Roentgen, KELEKET also offers a pledge for the future. KELEKET'S work has more than merely a commercial significance. For the products of the KELEKET Company are closely associated with the advancement of medical science and the preservation of human life.

THE KELLEY-KOETT MANUFACYURING CO., 2311 W. FOURTH ST., COVINGTON, KY.

KELEKET X-RAY



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Over 10,000,000 prescriptions are evidence of the Profession's high regard for its use in treating Gastric Hyperacidity . . . Peptic Ulcers . . . Colitis . . . Vaginitus . . . Diabetes Mellitus . . . Diarrhea and Dysentery . . . and in infant feeding.

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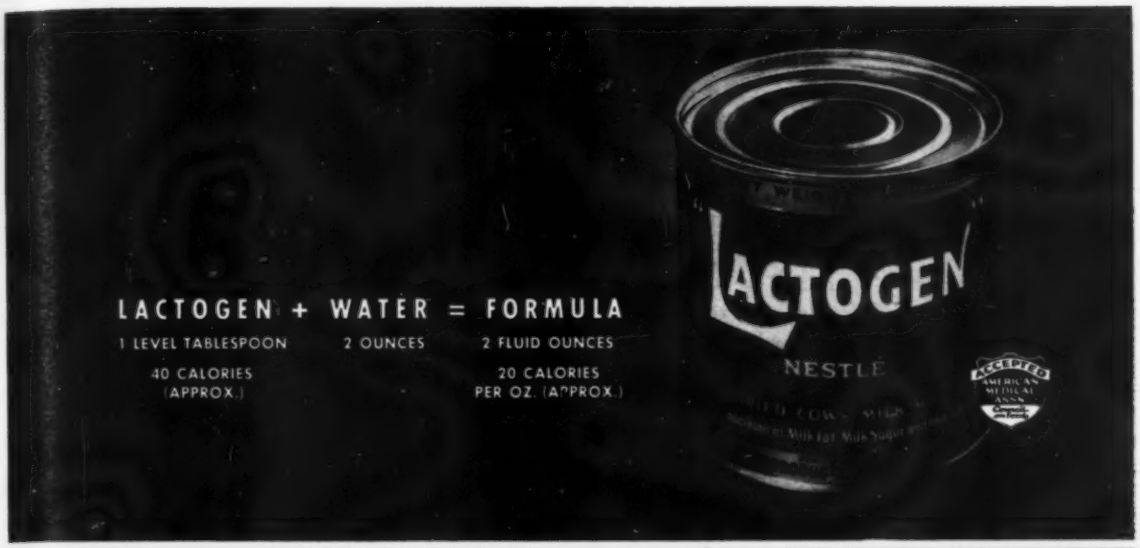
CEREAL LACTIC

Two Forms: "IMPROVED VITAMIN" and "ANTACID AND ABSORBENT"

Widely prescribed by the profession as an effective treatment for Gastro-Intestinal disorders.

CEREAL LACTIC COMPANY
Woodward, Iowa



Successful in Infant Nutrition

No advertising or feeding directions, except to physicians. For feeding directions and prescription pads, send your professional blank to

Nestlé's Milk Products, Inc.
155 EAST 44TH ST., NEW YORK, 17, N. Y.

BRUCELLOSIS

(UNDULANT FEVER)

★ 10% of the population of this country has been infected — as estimated by Gould and Huddleson, 1938.

★ Brucellosis should always be suspected and ruled out, wherever low grade fever, or extreme fatigue, headaches, etc., are persistent. Investigators have stated that 25% of all chronic cases will react positive to Brucellosis, when tested.

★ Brucellosis now has been recognized as an important public health problem in this country, according to Carpenter.

COLMETANESE

Clinical reports from doctors who have treated their Brucellosis cases with Colmetanese are uniform.

RESULTS ARE PROMPT
NO REACTIONS
NON-TOXIC
NO INTOLERANCE

12 five cc. AMPOULES....$10.00
25 five cc. AMPOULES....$17.50

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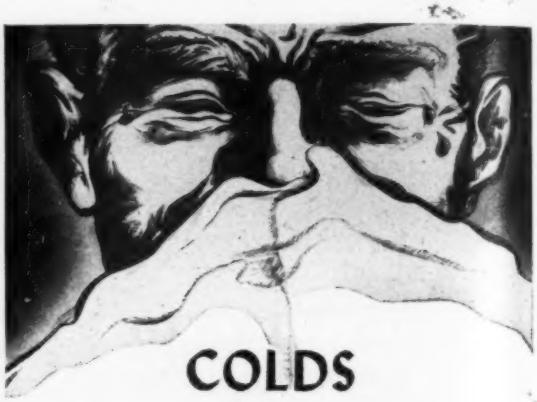

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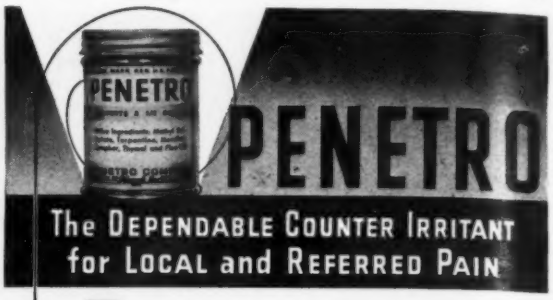

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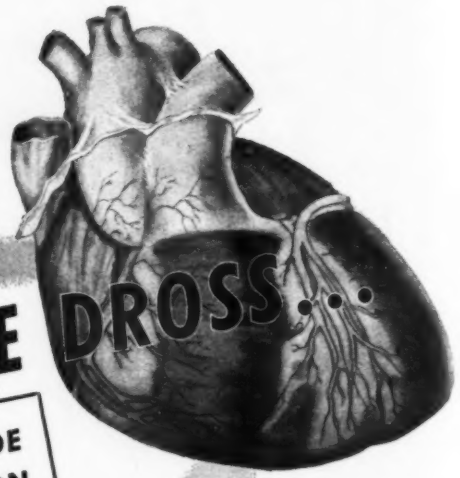

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[1] N.N.R., 1941, page 210.
[2] Gold, H.; Cattell, M.; Modele, W.; Kwit, N. T.; Kramer, M. L., and Zahm, W.: J. Pharmacol. & Exper. Therap. 82:187 (Oct.) 1944.

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The Journal of the American Osteopathic Association

PUBLISHED MONTHLY BY THE AMERICAN OSTEOPATHIC ASSOCIATION

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Observations on the Treatment of Hypermotile Joints by Injection

B. B. BAHME, B.S., D.O.
Dubuque, Iowa

INTRODUCTION

When I was 13 years old I fell through a trap door in a feed barn hay loft, landing on a hard plank floor almost 20 feet below. That was the start of a train of events leading up to this article. The fall gave me a severe left sacroiliac sprain, leaving me with a chronic weak back which kept me out of most athletics during high school and college. The first really serious attack of low-back trouble came on during my first year in osteopathic college, at which time osteopathic manipulative treatment was started.

Low-back trouble plagued me from then on, relieved only by osteopathic manipulation. In 1929 I was given a complete standing pelvic x-ray examination, which revealed a left leg shortness of one-half inch. A short series of manipulative treatments, and pelvic leveling by heel blocks, did help me very much, but I still had a bad low back which limited my activities considerably.

Seven or 8 years ago I saw an article by Dr. Earl Gedney, on sacroiliac injection treatment, and after investigation I started using the method. I secured such outstanding results that I instructed a neighbor osteopathic physician in the technic so that he could treat me. It cured me. I found I could resume golf, gardening, and many other activities that for many years I had not been able to engage in. From that time on I have been doing more and more injection work in the treatment of hypermotile joints, and at this time I feel I have something worth while to offer on the subject.

STATISTICS AND SOME DISCUSSION

I have treated approximately 500 cases of low-back weakness and several cases of hypermotile rib by the injection method, and from 100 of the former class treated in the past 7 years I have compiled certain statistics.

These 100 were not picked cases, but rather those on which I have the most complete records, and those carried to completion and observed afterward. All of them have standing x-ray plates in the anteroposterior position, and part of them in the lateral. (By the way, I firmly believe no physician should inject sacroiliac ligaments without x-ray facilities; the incidence of spinal anomalies, short legs, and unstable sacral angles makes this imperative.)

Following is a partial breakdown of the statistics given in more detail in the table.

Sex: Females—30, males—70.

Age: Youngest 12 years, oldest 75 years, average 39.15 years.

Spinal anomalies: Total 19; lumbarized first sacral—2; spinal bifida occulta—7 (fifth lumbar, 2, first sacral, 5); thoracic type lumbar facets—2; unilateral sacralization of fifth lumbar—2: transitional first sacral—3; imperfect arch first and second lumbar—1; fusion second, third and fourth lumbar—1; bifid arch fifth lumbar—1.

Short leg: Total 54; right—40; left—14.

Sacral angle unstable: 8, from 50 to 88 degrees.

Number of injections: Average about 6, more than half receiving injections on opposite side after affected side was normalized.

Months under my care: Average approximately 4; observation on most cases carried on from 6 months to a year or more.

Number of times treated by osteopathic manipulation: Approximately 15.

Results: Complete symptomatic relief—80; 90 to 95 per cent relief—14; 75 per cent relief—2; 50 per cent relief—2; complete failures—2. (The complete failures were both psychosomatic cases; the treatment overcame the hypermotility of the joint, but symptoms continued unabated.)

I have noticed that patients having arthritis of the low back all seem to show some improvement in arthritic symptoms immediately following injection; some to a lesser degree, but many to the point of very definite cessation. These most favorable cases are usually those with the definitely localized low-back arthritis, those which I should judge to be completely secondary to the constant irritation produced by low-back strain. I should say that part of this symptomatic change is due to the fluid injected acting as a foreign protein.

TECHNIC AND CASE MANAGEMENT

In every case, after the history is taken and physical examination completed, a standing anteroposterior x-ray view is taken, on a 14 by 17 inch film. My Bucky diaphragm is mounted on the wall in two grooved tracks with counter-balances, and has a vertical copper wire on the front surface which is directly

Fig. 1. Finding the correct point of entry for the needle over a left sacroiliac joint. The three black spots are india ink on the skin directly over the two posterior superior iliac spines with the spine of the fifth lumbar vertebra in the center. My left index finger is hooked just over the internal border of the superior iliac spine, and the needle is inserted through the skin just medial to that.

centered over the long axis of the plate; a plumb line was dropped from the lower end of the wire to the floor and a ½ by 8 inch strip was fastened to the floor at that point. When the picture is taken, the patient stands with his feet on either side and touching that strip; a 10 inch canvas belly-band is drawn across the pelvis, snug but not tight. This method gives an accurate check on the amount of pelvic sway from center. One or 1½ inches at the tops of the femurs is included in the picture to check for anatomical short leg. A lateral view is taken if there are any indications of abnormal sacral angle, such as a foreshortened sacrum, or a fifth lumber showing a wide ellipsoid view of the inferior border of the body.

With a complete diagnosis finished, osteopathic manipulative treatment is started. Heel blocks are used when needed, building up gradually in all cases having a shortage of over ¼ inch. Instructions are given in the use of cold applications in the home, and in most cases where lesion corrections are maintained for a week or 10 days, and the muscle soreness is overcome, injection is started. The first injection is only ½ cc. to establish patient tolerance. If the patient gets no reaction from this, the next one is either 1 or 1½ cc. a week or 10 days later, which usually gives some measure of reaction. All reactions can be controlled with the application of the ice-water bag for 5 minute intervals every hour or so on the bare skin directly over the joint.

In those cases of extreme hypermotility where it is impossible to maintain lesion correction from one day to the next, injection is started as soon as the condition becomes apparent. If the patient is in much pain the first injection or two is made with 1 cc. of Sylnasol mixed with an equal amount of Quinocaine.

I have used many different solutions for injection of ligaments, but in later years have come to use Sylnasol (Searle) exclusively for several reasons. First, it is nontoxic in the dosages used, and second, there is a minimum of hard scar tissue production and a maximum of tissue proliferation. Also it will restore normal ligament tone in a very short time. Minimum dosage is ½ cc. and the maximum is 1½ to 2 cc.

Frequently I am asked how many injections are required. The answer is, enough to return the ligament to normal tone and size, which is very easy to determine by "needle feel." A normal ligament imparts the same feeling as one would get in introducing a pin into the old cedarwood pincushion—possibly a bit firmer. The ligaments encountered in this work many times feel like relaxed muscle tissue, or even adipose tissue, because of their flaccidity and complete loss of ligamentous tone. To those who take up the injection of ligaments for the first time, there will come a distinct surprise when they find how much they can feel when putting a needle into a ligament; it is really very easy to sense the exact tone, texture and depth of ligament.

It is advisable to accept these cases under the flat fee plan only. I have tried it on a pay-as-you-go basis, and it does not work out. It gives the patient an opportunity to get into the driver's seat, and it is surprising how many of them will take advantage of it. In many old chronic cases with soft, flaccid and toneless ligamentous tissue, the patient will derive so much benefit from the first one or two injections that he will quit right then, advising the doctor that he is cured and there is no sense in going on with treatment.

Fig. 2. Needle in position to make the injection. Notice the angle, which puts it into the center of the short posterior sacroiliac ligaments. (Needle is 2 inch, 22 gauge long bevel; syringe, Vim high pressure 3 cc. capacity.)

Fig. 3. From Gray's Anatomy; injection area of right sacroiliac joint is outlined. White arrows to right posterior superior iliac spine and spine of fifth lumbar vertebra.

regardless of what he is told. Under the flat fee plan these cases get injections right through until the tissues are firm and normal, regardless of how soon symptom cessation takes place. On the flat fee basis it is much easier to keep all cases cooperating when it comes to posttreatment examinations to be sure that no additional injections are needed. It usually is not a good plan to attempt osteopathic manipulative treatment under 3 or 4 days after any injection is made, as tissue reaction will still be present. In some cases this reaction will persist for a week, and when that happens I usually dilute the Sylnasol with one third or one half of Quinocaine in subsequent injections.

In those cases where psoitis or a general myositis is present, I put the patient to bed for a week with instructions to apply the cold-water bottle every 2 or 3 hours during the day. Usually by the end of a week he is in much better condition, and an accurate diagnosis is much more easily arrived at.

An important question to be settled before injection is undertaken is whether or not the condition can be corrected by manipulation alone. I recognize any on the following list as suitable for injection:

1. Any case with a duration of more than 2 years, with or without previous manipulative therapy;

2. Any case showing spinal or pelvic anomalies, with 1 or more years' durations, with or without previous manipulation;

3. Any case with a duration of 2 weeks or more, that has had osteopathic manipulative therapy without maintenance of lesion correction, even with negative x-ray findings; these cases, with anomalies and short-leg ruled out, are the true hypermotile sacroiliac joint cases, and their duration is usually much longer because they get temporary relief under osteopathic care.

Many patients come to me with a history of the initial injury occurring within the past year, with no history of previous low-back trouble at all. If x-ray findings are negative, with no short leg, I treat them by manipulation for a month or 6 weeks. If lesion correction is maintained, with no backache or sciatica remaining, I discharge them without injection. I have injected such cases also, and will say that the recovery is very definitely speeded up with just one or two light injections, due to the immediate increase in the tone of the ligaments.

Under contraindications I would list:

1. Presence of such diseases as malignancy, tuberculosis, diabetes, severe myocardial or arterial disease, hyperthyroidism or any acute febrile condition;

2. Pregnancy, all but the first trimester, and even these to have only a very few injections with instruction to return a month or two after delivery to complete the treatment.

3. Cases having had previous injections of any sort with results showing any allergic diathesis or possible sensitivity to injected material; in all these I run a skin scratch test first.

APPLICATION IN VARIOUS CONDITIONS

Spinal Anomalies. As I understand the effect of spinal anomalies of the low back, I should say that some of them produce weakness because of structural incompleteness of the bony parts, while all of them produce weakness by the splitting up of the supporting ligaments. Once these lesser ligaments are injured, they are very liable to stay in a weakened, toneless condition, allow the muscles of the region to bear the most of the load of supporting the joints. The cases with anomalies have been the worst I have had, from the standpoint of symptom severity; they were the weakest, the most disabled, and the greatest shoppers of any of the series. Strangely enough, they seemed to derive the greatest benefit from injection treatment, as a short resume of several of these cases will show.

Case 4: Male, aged 43 years, rancher, came with a history of recurrent attacks of low-back pain over a period of 20 years, was totally incapacitated for work and sometimes could manage only to get around enough to feed himself; had been to a nationally known clinic the year before, where a bone graft was advised. Standing anteroposterior x-ray showed a spina bifida occulta of the 5th lumbar arch, and a right leg shortness of ¼ inch. As I was preparing to move from the state in less than 10 days I tried to refuse, but he would not be put off; he had seen the results in his neighbor and insisted on starting treatment. A ¼ inch heel block was placed in his right shoe, osteopathic manipulative treatment started, and two 1½ cc. injections were given in the area of the superior fibers of the left short posterior sacroiliac ligaments. Two months later he came to my office in my new location, reporting that he was much improved. Two more injections were given, one on the left and one on the right, in the same area, as deep as I could get with the needle. Fourteen months later I received a letter stating that he was working every day, was feeling better and sleeping better than he had for years. (Plate 1). (I regret that I did not make a lateral plate also; from the

PLATE 1

appearance of the anteroposterior I believe he had also an unstable sacral angle.)

Case 7: Male, aged 26 years; 10 years' duration; fifth lumbar sacralized on the left; legs of equal length. There was a history of almost continual low-back pain, easily aggravated by any athletics or hard work. He had been advised repeatedly to have the excess bone growth clipped off. He had a medical discharge from the Army Medical Corps, had been under constant osteopathic care for most of the duration of his trouble. Examination revealed more weakness in the sacroiliac ligaments on the right than the left, and six injections were given at 1 to 3 week intervals. Results were very good, muscular rigidity and tenderness disappearing after the first few injections. After the sixth he was told to report back in 30 to 60 days. A little over 2 months later he came back saying he had had some backache which seemed to come from the left side, the side of the sacralization. Four injections were given on the left; that was almost a year ago, and he has been symptom-free since (Plate 2).

Case 14: Male, aged 62 years; history of low-back trouble for past 15 to 20 years; x-ray showed right leg ¼ inch short, spina bifida occulta of the first sacral, some arthritic involvement. After 6 months treatment, including frequent osteopathic manipulative treatment with the use of the McManis swinging leaf, plus five injections on the right and two on the left, he was symptom-free, and has remained so for more than 9 months (Plate 3).

Short Leg. It is interesting to note that of the fifty four short leg cases, forty were of the right leg. Usually the anteroposterior standing plate will show a sweeping lumbar curve with the convexity to the short side; however, in heavyset people or those

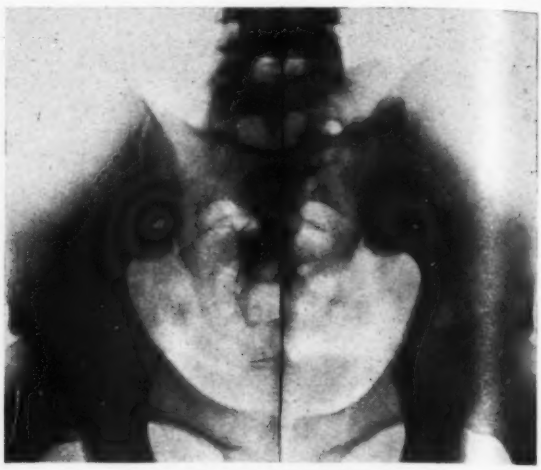

PLATE 2

having very strong back muscles we sometimes find a lumbar spine with no lateral curve whatever, and in these cases ligament injection is not needed. I have on more than one occasion made a test injection on such cases only to find the ligament perfectly normal. A heel block plus a course of good osteopathic manipulative treatment is all that is needed.

To illustrate, let us consider a case of extreme sacroiliac weakness having only a ¼ inch shortness on the right: Case 34: Male, aged 41 years; history of low-back trouble of over 20 years' duration; disc operation 16 years before, with no improvement in back symptoms. Standing anteroposterior film showed much rotation with the lumbar curve, with the convexity to the short side. I treated him over a period of 5 months, giving five injections on the left and two on the right; manipulative treatment with use of the McManis swinging leaf was of especial benefit. The three plates made during the course of treatment show very well the swing-back produced as the treatment progressed. He has been symptom-free about a year (Plates 4, 5, 6).

There is one type of low-back affliction in which the injection treatment has proved, at least in my

PLATE 3

PLATE 4

PLATE 5

PLATE 6

experience, to produce almost miraculous results. That is the unstable sacral angle case. As far as I can determine from literature at hand, the treatment of such cases ordinarily is limited to the application of braces and belts, usually with unsatisfactory results. Use of the injection method in building up the strength of the supportive ligamentous structures of that region is, I believe, something entirely new in that type of case. As the table indicates, there are eight of those cases on which I have complete records, and while that is certainly not many, at least it is a start, to which I hope to add many more in years to come.

Case 32: The first case of this type that I treated and, so far, the very worst of all of them, illustrates what can be done with this treatment. Female, aged 44 years, came in December, 1942, with a history of a fall resulting in a "torn ligament in the low back"; under non-osteopathic care for the previous year. She had steadily gone from bad to worse until she was

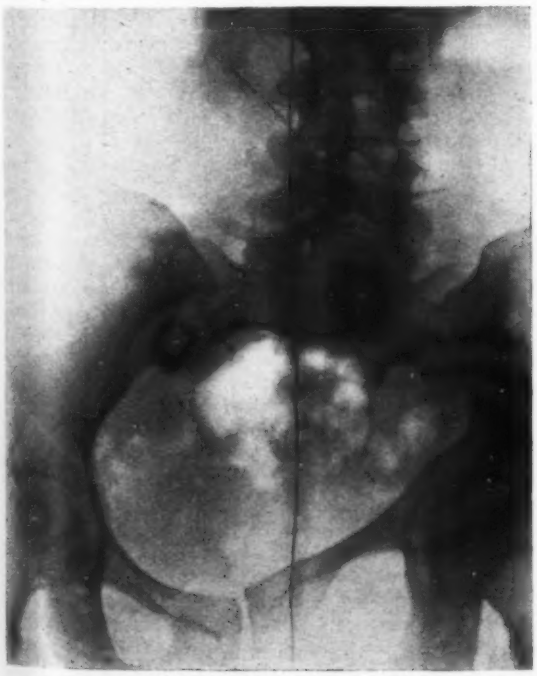

PLATE 7

PLATE 8

PLATE 9

totally incapacitated for any house work. She was a ranch woman, had reared seven healthy children and had never been to a doctor for anything except obstetrical deliveries until the fall occurred. After an anteroposterior standing x-ray plate was taken and viewed, further questioning brought out the fact that she had been in a severe runaway accident at the age of 12. A chuck wagon had overturned, pinning her under it with one side resting across her pelvis; she had been unable to walk for 3 months, but no doctor was consulted. (Doctors were few and far between in North Dakota in those days, the closest one being well over 100 miles away.) The anteroposterior plate showed a badly smashed pelvis, undoubtedly the result of greenstick fractures of both innominates, also a spina bifida occulta of the first sacral. I was much puzzled at first by the appearance of the upper portion of the body of the sacrum, until I realized that it was almost an end-on view; so a lateral standing plate was taken, which showed the unbelievable sacral angle of 88 degrees. Treatment was started, and continued for 6 months, the patient resuming her heavy ranch-house duties after 2 months had gone by. Ten injections were given, five on the right and five on the left, but not into the sacroiliac ligaments, because the first injection attempted there revealed fairly normal tissue. The injections were primarily aimed at the capsular ligaments of the lumbosacral joints, fanning out in that area above the superior fibers of the short posterior sacroiliac ligaments. Osteopathic manipulative treatment was administered frequently between injections, using the swinging leaf, normalizing muscle tone and stimulating circulation of the entire low-back area. I have checked on this case repeatedly and after 3 years the patient is still able to do all of her own work (Plates 7 and 8).

Case 71: Male, aged 43 years; iron molder; history of low-back trouble over 15 years, with a record of many visits to well-known orthopedic clinics and specialists. Standing anteroposterior plates revealed a bifid arch of the fifth lumbar and an apparently very short sacrum, indicative of an unstable sacral angle, so a lateral picture was taken, which

PLATE 10

showed the sacral angle to be 58 degrees. He was treated just 2 months, including five deep injections in the areas of the lumbosacral articulations on both sides, with osteopathic manipulation administered about twenty times. When injections were started the deep ligaments were soft and flaccid, feeling almost as if the needle was in adipose tissue. When he was flat on his back the toe-heel angle on each side was practically nothing—less than 10 degrees—due no doubt to the flacidity of the entire low-back supportive ligamentous structures. When treatment was finished that angle was 45 degrees on each side. Recovery was complete, and after 7 months he is doing his usual heavy work with no return of symptoms (Plate 9).

Case 12 is interesting as a pure sacroiliac sprain occurring in a badly deformed spine. Female, aged 48 years; history of a back injury 3 to 4 months previously; under non-osteopathic care (three different physicians) she had not improved at all; no x-ray examinations had been made. Standing anteroposterior view (Plate 10) revealed a left leg shortness of ½ inch, and a sharp upper lumbar scoliosis with fusion of the second, third and fourth. Repeated questioning revealed no history of any accident in her early life or of tuberculosis in the family; in fact she admitted that she had never been to a doctor before she hurt her back, and had done a man's work in the fields since she was 12 years old. The only explanation I could think of as to the cause of the lumbar deformity and fusion was a prenatal injury. Since all of her pain seemed to be in the right gluteal and groin regions, and she had an acute right sacroiliac lesion, treatment was started on that side. Heel blocks were used to level the pelvis gradually. Eight injections were given, and the lack of needle resistance

where the short posterior sacroiliac ligaments should have been was amazing; the needle seemed to drop into a 3 inch hole just medial and inferior to the right posterior superior iliac spine. By the time the eighth injection was given there was definite normal ligament resistance to the needle point ½ inch under the skin, and the patient had returned to her work on the farm.

HYPERMOTILE RIB INJECTION

I have treated about a dozen cases of hypermotile ribs by the injection method. This limited experience leads to the belief that in certain cases this treatment

TABLE

Case No.	Sex	Age	Arthritis	Spinal Anomaly	Sacral Angle	Short Leg	Years Duration	Months under Treatment	No. of Injections	No. of Osteo. Manipulations	Results (in percentage of symptom relief)
1.	F	26	no	none	N.	no	10	5	8R.	25	95%- rt. hip a bit stiff.
2.	F	31	no	none	N.	no	2	4	6R.	15	100%
3.	M	42	no	none	N.	L.3/16	25	2	4L1R	12	100%
4.	M	43	no	Sp.Bif.Occ. 1-S	N?	R¼	20	3	3L1R	8	100%
5.	M	28	no	Imp.Arch 1,2L.	N	L.¼	20	4	8R	15	100%
6.	M	58	mild	none	53	L.¼	10	4	5L3R	15	100%
7.	F	34	no	none	N	R.¼	7	6	5L3R	50	100%
8.	M	51	mild	none	N	L.¼	35	6	5L.	20	100%
9.	F	65	yes	none	N	R.¼	1½	7	7L.	25	100%
10.	M	40	yes	none	N	L.¼	20	5	5L.	25	90%- stiffness
11	F	33	no	Disk op. 7yrs ago	N	no	9	5	4L.	10	75%- needs Hysterectomy
12	F	48	no	2,3,4L fused	N	L¼	¼	5	8R.	15	100%
13	F	24	no	none	N	R.5/8	3	3	2R4L	10	100%
14	M	62	yes	Sp.Bif.Occ.1-S	N	R¼	15	6	2L5R	25	100%
15	M	34	no	none	57	R¼	20	3	5L6R	20	100%
16	M	31	no	none	50	no	1½	3	7L	10	95% - some strain
17	M	69	yes	Sp.Bif.Occ. 5-L	N	R¼	45	3	4R	10	90%
18	M	29	no	none	N	R¼	¼	6	7L	25	100%
19	M	40	no	none	62	R.5/8	14	5	1R11L	30	98%
20	M	38	no	none	N	L.¼	3	5	6R		100%
21	M	35	no	L.Sacraliz.5-L.	N	R¼	6	3	5R	6	100%
22	F	59	mild	none	N	R¼	4	2	4L	15	90%
23	M	17	no	none	N	no	2	4	4R2L	35	Psychosomatic- pain yet
24	M	61	bad	10,11D,1L fused	N	R¼	25	6	3R	30	100%- Arth. gen. bad
25	F	32	no	none	N	R.5/8	5	2	3R	10	100%
26	F	41	no	none	N	R.3/8	7	4	6R	25	100%
27	F	36	no	none	N	no	15	6	5L1R	25	100%
28	M	51	no	none	N	no	5	3	6L	10	100%
29	M	40	no	none	55	no	15	5	3R3L	25	90%
30	F	34	no	none	N	no	7	8	4L3R	50	Psychosomatic- pain yet
31	M	26	no	L.Sacraliz. 5-L	N	no	10	7	6R4L	25	100%
32	F	44	no	Pelvic fracture early, Sp.Bif. Occulta 1-S	88	no	27	6	5R5L	25	100% ck for 3 yrs
33	M	13	no	Lumbarized 1-S Tn. type facets	N	R¼	½	1	3L	8	50%- back very weak
34	M	41	no	Disk op-16 yrs ago	N	R¼	20	5	5L2R	15	100%
35	M	63	yes	none	N	R¼	50	5	6L	15	100%
36	M	37	no	none	N	L¼	24	4	5L5R	15	100%
37	M	66	yes	none	N	R¼	25	5	5L	15	100%
38	M	56	yes	none	N	no	10	1	3L	10	100%
39	M	32	no	none	N	no	¼	1	3L	20	100%
40	M	75	bad	none	N	R¼	4	3	3L	20	100%
41	M	38	no	none	N	no	6	2	2L	15	100%
42	M	30	no	none	N	no	10	4	4R	10	100%
43	F	45	no	none	N	no	1	3	4R	15	100%
44	M	34	no	none	N	no	10	3	4R	18	100%
45	M	50	yes	none	N	no	2	6	6L	20	100%
46	F	29	no	none	N	no	1	4	5L1R	15	100%
47	M	41	bad	none	N	no	20	6	5R	10	100% arthritis gen.
48	M	33	no	none	N	no	10	3	3L	25	100%
49	M	38	no	none	N	R¼	10	2	3L	10	100%
50	M	30	no	none	56	no	15	4	5L7R	25	100%

(Table continued on next page)

Case No.	Sex	Age	Arthritis	Spinal Anomaly	Sacral Angle	Short Leg	Duration Years	Treatment Months under	No. of Injections	No. of Osteo. Manipulations	Results (in percentage of symptom relief)
51	F	40	mild	none	N	R.¼	1½	2	3L	8	100%
52	F	12	no	Sp.Bif.Occ.1-S.	N	no	1	1	4R	5	100%
53	M	36	no	complete sacrolization 5-L.	N	R.3/8	13	4	4R	15	100%
54	F	23	no	Sp.Bif.Occ 1-S Thor. L. Facets	N	no	1½	5	8R1L	25	50%
55	M	37	no	Sp.Bif.Occ.1-S	N	no	4	3	5R	8	100%
56	M	38	mild	none	N	no	1	4	4R	12	100%
57	F	37	no	R.Sacralized 5-L	N	R¼	1½	4	4R	10	100%
58	M	43	bad	none	N	L½	12	4	5R	15	75%
59	M	34	no	Transitional 1-S	N	R½	6	2	3R	6	100%
60	F	34	no	none	N	R¼	2	4	5R	9	100%
61	M	26	no	none	N	no	6	5	6R3L	15	100%
62	F	55	no	none	N	no	30	5	6L	25	90%
63	M	30	no	none	N	R¼	15	5	4R4L	15	100%
64	M	18	no	none	N	no	2	3	4R	7	100%
65	M	33	no	none	N	no	15	3	4R2L	15	100%
66	M	49	mild	none	N	no	15	5	4L1R	12	90%
67	M	33	no	none	N	R½	1	1	1R	3	100%
68	M	37	no	none	N	R½	15	6	7L	10	100%
69	F	31	no	none	N	L5/8	5	3	5L	8	100%
70	F	29	no	none	N	R½	8	7	6R2L	25	90%
71	M	43	no	Bifid arch 5L	58	no	10	2	5R5L	18	100%
72	M	48	yes	Transitional 1-S	N	R½	20	3	5R	15	90%
73	F	16	no	none	N	no	1	4	4R	12	100%
74	M	50	no	none	N	no	15	4	4R	18	100%
75	F	50	no	none	N	no	3	3	6L	15	100%
76	M	31	no	none	N	L½	12	3	3L	3	100%
77	M	38	no	none	N	no	4	4	3R	15	100%
78	M	37	no	none	N	no	10	4	5R1L	10	100%
79	F	13	no	none	N	no	1	2	4R	5	100%
80	M	38	no	none	N	L.5/8	10	3	3R	10	100%
81	M	29	no	none	N	R½	8	4	6R	10	100%
82	M	38	no	none	N	no	3	2	3R	15	100%
83	M	35	no	none	N	R.5/8	20	4	5R	12	100%
84	M	40	no	none	N	R¼	21	4	6R	15	100%
85	M	29	no	none	N	r¼	15	3	4L	9	100%
86	F	55	bad	none	N	no	25	3	3L	10	90%
87	M	44	no	none	N	R½	25	6	4R3L	15	100%
88	M	35	no	none	N	no	12	2	3R	4	100%
89	F	35	no	Transitional 1-S	N	R½	½	2	3L	8	100%
90	M	58	yes	Sp.Bif.Occ. 1-S	N	no	25	4	2L3R	15	95%
91	F	27	no	none	N	no	10	4	5L	10	100%
92	M	58	yes	none	N	R½	20	3	3L	15	90%
93	M	34	no	none	N	no	15	4	4R	6	100%
94	M	38	no	none	N	no	10	4	4R4L	4	100%
95	M	32	yes	none	N	L½	10	4	4L	10	100%
96	M	42	no	none	N	no	20	3	3L	5	100%
97	M	57	yes	none	N	L½	12	4	3L	7	100%
98	M	42	no	none-	N	L½	17	4	3L	6	100%
99	F	43	no	none	N	R.5/8	25	4	4L	15	100%
100	M	38	no	none	N	R½	20	5	4R2L	15	100%

offers something that goes much farther than other methods. While the actual technic of injecting the costotransverse joint is much more difficult than in other joints, it is essentially the same. The particular tissues for the needle to enter are: the ligament of the tubercle, and the articular capsule. I have found that two to three injections in and around the region of these tissues are sufficient in most cases, using ½ to 1 cc. of Sylnasol each time. In those cases having an acute myositis of the area, with subsequent pressure neuritis and neuralgia, where it is impossible to maintain correction for a very long period, I give one to two injections of Farnsworth's Quinocaine, 1 to 3 cc. each time, to desensitize the area. Instruction is

given to these patients to protect the part from all motion if at all possible; we put the arm in a sling that carries the full weight of the arm, and use ice-water packs to the skin over the area for 5 minutes several times daily. Often I have mixed 1 cc. of Sylnasol with 1 cc. of Quinocaine and injected the ligaments at once, although the results are not achieved as quickly in this way, because of the dilution of the Sylnasol.

I find that many hypermotile rib cases are due to sacroiliac weakness. The reason is evident after a moment's consideration of spinal mechanics. The scoliosis or torsion does not affect the upper lumbar for compensation takes place without symptoms. The thoracic region up to the fourth or fifth will also compensate, swinging the ribs somewhat anterior on the convex side and posterior on the concave, because of their floating and semi-floating character. From the fourth or fifth up to the second or third, they will not swing because of the angle at which the cartilage joins the rib to the sternum. Such swing would necessitate an actual end-to-end compression of the cartilages in most cases, bringing on a buckling or bulging at the sternal end, which actually occurs only in the most severe of scoliotic curvatures. Consequently the spine continues to compensate in that region, but at the expense of actual lesion production at the costotransverse articulations, the worst lesion being either the fourth or fifth because of the usual true horizontal position of one of their cartilages at the sternal end. (When I speak of torsion, I am thinking of the prescoliotic twist occuring secondarily in every true case of unilateral sacroiliac weakness.) In plates 3, 4 and 5 (especially 3) the torsion is very apparent. It is interesting that this case came because of a hypermotile rib on the left side, which gave considerable trouble in the left shoulder and arm. It disappeared completely after completion of treatment on the sacroiliac joint, no injection at the rib joint being needed after osteopathic lesion correction was maintained.

CONCLUSION

Treatment of hypermotile joints by the injection method is a very distinct advance over such treatment as has been used in the past. It offers to the physician who uses it, the opportunity of taking cases that have been shunted from pillar to post, from this clinic to that specialist, in a vain effort to get some permanent relief. The results in such cases will more than satisfy the conscientious physician, will make him proud to say he is an osteopathic physician, following in the steps of Dr. A. T. Still, one of whose best-known maxims was: "Find it, fix it, and leave it alone."

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The Use of Respiratory Movement As an Aid in the Correction of Osteopathic Spinal Lesions

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It has long been the practice of many physicians to ask the patient to breathe in some particular way as corrective technic is applied to osteopathic spinal lesions so that the manipulation may be more easily and effectively executed. For instance, in many operations relaxation is better as the patient exhales, a condition which makes correction of the lesion easier. But the routine use of respiration as an aid to the correction of spinal and sacral lesions has not been general and as far as I know not much has been published concerning this principle or its application, although many special and specific technics have been advanced in which it is used.

Frances W. Harris has advocated a method of chest molding with breathing as the corrective force. W. G. Sutherland advocates its use as a corrective force in cranial therapy. Indeed, it was while studying his methods that I coordinated his respiratory movement idea with my knowledge of sacral movement resulting in the corrective procedures described, in part, in my paper: "Respiratory Mobilization and Molding of the Sacrum," presented by Dr. Kenneth E. Little and myself at the general sessions of the 1944 Convention of the American Osteopathic Association held in Chicago. This paper has recently appeared in the "Yearbook of the Academy of Applied Osteopathy."

As stated in that article, "The principle of correction is to exaggerate the lesioned position of the articulation, hold it in exaggeration and use respiration to secure articular release and mobility."

At the same time I applied the principle to spinal lesions, finding that it worked equally well with them. The concept is this: All normal spinal and sacral joints, and indeed, probably all viscera, have an orbit of excursion during respiration. It seems that they move in one direction during inhalation and return in the opposite direction during exhalation. Movement in this orbit is one of the factors necessary for physiological function of the related parts as well as for physiological activity of the related tissues. In the presence of osteopathic articular lesions resulting in abnormal conditions that lead to impairment of function, and pathological conditions, there is interference with the normal respiratory excursion.

A given lesion occurs at a certain point in the respiratory cycle and in a certain position. In correction, the related parts are moved to the point of release by slight exaggeration of the lesion as the patient breathes deeply. The release occurs in the position at which the insult to the joint took place and at the point in the respiratory cycle at which the lesion was produced. In that certain position and at that certain point the respiratory movement picks up the abnormally related parts and swings them into motion in unison with contiguous parts.

This motion in unison with contiguous parts during the respiratory cycle is the immediate object of the corrective maneuver, and the osteopathic articular lesion is reduced when these conditions are fulfilled. The relation between the parts in-

volved is now physiological and they can be moved easily to any other physiological relation.

It is wise to have the patient breathing deeply, because the lesion may have been, and frequently is, produced in either deep inhalation or deep exhalation. Breathing by the patient will frequently correct lesions if the parts are placed in a relaxed or released position. This is probably Nature's way of doing the job. However, severe lesions require aid from the physician to release them. Here, as always, an accurate diagnosis based on a knowledge of the physiological movements of the related parts is essential to secure the release. After the release has occurred, the physician applies pressure, which stretches the retaining soft tissue, or he delivers a thrust which changes the tensions quickly, in the direction of the correction, as his experience and judgment decree; or the patient may turn one segment of the lesion toward normal, as directed, while the physician holds the other.

To illustrate this idea a specific lesion may be visualized. Let us assume a person in whom the thoracic region is in physiological extension, as when one is tugging to lift a stuck window, the normal thoracic curve being decreased (flattened in the mid-scapular region). He is holding his breath in inhalation with his face turned completely to the right and his head thrown slightly back. As he tugs, holding his breath, a fly comes close to his face on the left side and he tosses his head to scare the fly away, producing an unphysiological strain on the already tense tissues between the third and fourth thoracic segments of the spinal column.

The insult to the tense tissue produces the tissue changes which are known as an osteopathic lesion and which prevent the return of the parts to normal relationship and function. The body of the third vertebra is turned and tipped (rotated and sidebent) to the right on the fourth as a base. The spinous process of the third vertebra has been locked to the left of that of the fourth and is closer to it than usual because of the extension present in the region. Tissues on the right side tend to be compressed and approximated and on the left stretched and separated.

Thus we have a lesion produced in a certain position, i.e. extension with rotation and sidebending to the right. Also it was produced in the inhalation phase of the respiratory cycle.

The correction follows a diagnosis of position and restricted mobility. The third segment is placed in a position, in relation to the fourth segment, in which the lesion was produced, and then moved to the point of freest mobility. Since the tendency of the parts is toward normal relations the third has been drawn as far as possible toward the normal. Therefore to attain the point of greatest mobility, which is the exact position where the insult took place which produced the lesion, it is necessary to carry the parts slightly more into extension and rotation and sidebending than they are when examined by the physician. This is the so-called exaggeration of the lesion. Its purpose is to release as far as possible the restraining tissues which hold the lesion. You will recall Dr. Still's comparison of this to the fact that one must get a little slack in the rope in order to unsnap the halter of a mule tied to a tree and straining to get to a bit of grass out of his reach.

When the position of greatest release is attained the patient, who has been breathing normally, is asked to breathe deeply. When he inhales he comes to the point in the respiratory cycle where he was holding his breath when the lesion was produced. At that point the released third segment tends to move with the fourth in the normal respiratory range subject to the position in which the segments are found. This releases tissue so that it is now possible to return the vertebrae to normal positional relations. This is accomplished either by the physician carrying the third segment into proper relation with the fourth as the patient breathes, or by the patient doing the same maneuver under direction of the physician.

To be specific, let us describe two methods of correction. Many more could be described. Indeed the principle may be applied in any technic which is physiological, but the two will illustrate sufficiently.

No. 1. Patient supine on table or across bed. Operator seated at head. Operator's right hand controls head and neck and thoracic segments down to third, and is used to produce needed flexion or extension and sidebending and rotation. His left hand is in the midscapular area with the hand crosswise and the tip of the spinous process of the third thoracic vertebra in the crease created by flexion of the first finger at the metacarpophalyngeal joint. The patient is breathing naturally and is as relaxed as possible.

To secure extension, the left hand is used as a fulcrum which may be elevated or lowered while the right hand lowers the head toward the table. At the same time head and neck are rotated and sidebent to the right, carrying the third vertebra into that relation with the fourth. The left hand detects the motion and the operator senses the correct degree of extension, rotation and sidebending to secure the maximum release.

The patient is now asked to breathe deeply and after a breath or two the tissue seems to release and the whole region moves in unison. Then the operator, warning the patient to continue breathing (the tendency being to hold the breath) by synchronous changes in position of the two hands carries the third vertebra into flexion as he changes the sidebending and rotation of the head and neck to the left. The patient breathes deeply, in this the corrective position, a number of times. Usually this is sufficient to secure correction but at the discretion of the physician he may use considerable pressure or a sharp thrust in the direction of the correction, applying the force by the synchronous use of the two hands.

No. 2. The patient and operator are in the same relative positions as those in No. 1. Diagnosis is the same. The hands of the operator are applied differently, however. The tips of the fingers are applied to the angles of the ribs, the left on the fourth and the right on the third. The elbows are on the table to insure relaxation and give leverage.

Extension is secured by gently lifting the interscapular area with the fingertips as the patient rolls his face to the right. The physician instructs the patient as to how far he is to roll his head and

how much tension he is to maintain. Also by pushing the head with the elbows he may control the sidebending. When the point of the greatest mobility is found the patient is asked to breathe deeply several times and, breathing all the while, to lift the head from the table and gradually carry the face and head to the left and place it on the operator's forearm (which position maintains the necessary flexion with the corrective sidebending and rotation). He then breathes several times and pressure may be applied to the vertebrae, through the ribs, by the finger tips, in the direction of correction to complete the maneuver.

Thus we have, in the two technics described, taken into account the relative positions of the parts in lesion and the respiratory cycle of movement which was used to help release and correct the abnormal relations.

The linking of these two factors is the main point of the article. Its advantages are that the correction is specific and non-traumatic, being well received by the patient as well as requiring little physical effort, thereby conserving the physician's strength.

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Roentgen Diagnosis and Treatment of the Atypical Pneumonias

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Terminology.—The term, *primary atypical pneumonia,*[1] etiology unknown, as adopted by the Commission on Pneumonia, Board of Investigation and Control of Influenza and other Epidemic Diseases in the United States Army, obviates the confusion of so many terms that have been applied to this condition.

This term eliminates those conditions of the lung in which there are consolidations caused by bacteria, and those due to chemical agents, mycotic infestation or known viruses.

There are those who disagree with this terminology and prefer the term, acute pneumonitis[2] because of the pathological condition found which is described as an interstitial pneumonitis.[3]

The condition is a relatively benign lung involvement, with a low mortality rate, usually running a course of from seven to ten days with the more severe complicated cases persisting thirty to sixty days.

Etiology.—The cause is unknown, but probably a virus. Psittacosis presents the same symptoms and roentgen findings and pneumonitis must be differentiated from this.

Immunity.—There is little known as to immunity to the disease.

Incidence.—Most of cases reported in the literature are of military age. We will know more about the age and sex incidence when more of the general public who have upper respiratory symptoms are sent for roentgenograms of the chest.

It is apparently widespread; cases have been reported in England, Germany, France, the United States, Panama, Hawaii and the British West Indies.

Mode of Transmission.—Levin[3] says: "Knowledge of the mode of spread in atypical pneumonia is fragmentary. At present it appears that the disease varies from a mildly to a highly communicable infection. The development of five cases among the resident staff of a hospital all traceable to a single case bears out this view. During an epidemic at Camp Claiborne, La., three times as large a percentage of cases occurred among the hospital personnel as in the troop population. Twelve of the thirteen affected persons had had opportunity for close and repeated contact with the disease. Probably droplet infection from cough is the mode of spread." The incubation period is not known.

Laboratory Findings.—The sputum contains organisms usually found in the mouth and nasopharnyx. The leucocyte count is usually normal or slightly higher, with usually a normal differential count. There is a high leucocyte count with high neutrophile count which appears to vary with the severity of the infection as well as with the incidence of mixed infection. The sedimentation rate varies from 20 to 40.

The urinary findings are normal, with the presence of albumin only in advanced cases, as in any prolonged infection.

Roentgen Findings. — McCarthy[4] classifies the cases into four groups according to their roentgenographic appearance. Group 1: The earliest change is enlargement of higher shadows with increased prominence of the lung markings. Later there is development of parenchymal density, somewhat less than that seen in lobar pneumonia, with linear lung markings visible through it. Group 2: The lesion appears as a patchy involvement usually confined to a single lobe. The appearance is suggestive of bronchial pneumonia. This type shows rapid initial resolution. Group 3: This is an interesting group in which the infiltration radiates from the hilar region, closely simulating tuberculosis. Group 4: Those cases show increased lung markings throughout and small parenchymal areas of infiltration somewhat simulating military tuberculosis.

Lewis and Lusk[5] describe bronchitic, peribronchitic, and alveolar phases.

Stein and Kresky[6] have the following to say: "During the course of twelve months, from August, 1942, through July, 1943, 2,062 cases of pneumonia were seen at the Regional Station Hospital in Sioux Falls, S.D.; 950 were bacterial pneumonias and 1,112 were primary atypical pneumonias. From a review of these cases, we have come to the conclusion that any attempt to determine the probable etiology of a case of pneumonia from the roentgenogram *alone* is an extremely inaccurate procedure. Cases of primary atypical pneumonia may present a roentgen appearance indistinguishable from that of pneumococcic or other bacterial pneumonias, especially the early and/or resolving stages of the latter. Contrary to most of the descriptions in the literature, we have seen many cases of atypical pneumonia which did not originate in the hilar regions and extend outward, but occurred as circumscribed foci in the periphery of the lung field. We have also seen primary atypical pneumonias occurring in the upper lobes, with roentgen findings simulating those of tuberculosis."

Hufford and Applebaum[7] describe the migrating type with lesions spreading from one area to another quite rapidly.

Clinical Picture.—The patient usually has rather vague symptoms. He has not felt well for several days. His symptoms began with chilly sensations, then he felt feverish. Chest pain may be present, respirations are normal or slightly increased, temperature varies from 101 to 104 F. with a slow pulse. There is a dry cough which later is productive. He may have sore throat. Van Ravenswaay *et al.*,[8] reporting on 1,862 cases at Station Hospital, Jefferson Barracks, Missouri, give the following tables:

Table 1. Atypical Pneumonia: frequency of occurrence of symptoms in 297 cases.

TABLE I

	Symptoms	Percentages of Occurrence
Onset	Gradual	67.2
	Acute	32.8
Constitutional Symptoms	Feverishness	85.5
	Malaise	70.4
	Chilliness	68.0
	Headache	48.0
	Rigor	11.5
Symptoms referable to respiratory tract	Cough	86.2
	Sputum	
	Nonbloody	49.0
	Blood streaked	23.9
	Bloody	2.4
	Prune juice	0.4
	Coryza	49.0
	Sore Throat	47.0
	Thoracic pain	69.5
	Substernal	20.4
	Pleural on motion	47.7
	Thoracic on rest	11.2

Their comment was that this series of cases was more virulent than other series that have been reported.

Blood and urine examinations are usually normal in uncomplicated cases.

Complications.—Serious complications are rare. Owen[9] reports 4 per cent exhibit roentgen evidence of pleurisy, usually as cloudiness of the costophrenic angle. In only 2 per cent was there clinical evidence of fluid.

Campbell *et al.*[10] report a fatal case with complications of the central nervous system. Perrone and Wright[11] report one fatal case with encephalitis.

Differential Diagnosis.—The chief difficulty is that there is no characteristic picture of atypical pneumonia. Repeated roentgenograms usually will rule out other forms of pneumonia.

In differentiating atypical pneumonia from resolving lobar pneumonia, we must remember that atypical pneumonia begins to resolve at the periphery, while in most cases of lobar pneumonia resolution begins near the hilum.

Diagnosis.—There is a marked difference in the onset between atypical and pneumoccocal pneumonia. Early in the disease the roentgenogram gives evidence of a lung congestion before the physical examination reveals anything of importance. The laboratory findings have been given previously. The disease fails to respond to chemotherapy.

Treatment.—Drew, Samuel and Ball[12] says that no drugs are known to have any influence on the course of the disease. Numerous writers report that the sulfonamides have no effect on the disease. Several report the ill effects of these drugs, and others remark that they have seen patients' lives saved by taking them off such drugs.

All writers agree that rest, diet, and symptomatic treatment, especially the relief from cough by sedation and the use of oxygen in marked disturbance of respiration, are the best treatment.

A few writers suggest the use of sulfathiazole for a period of 48 to 72 hours or until a definite diagnosis is made.

Clinical symptoms subside before the roentgenogram shows the process of resolution in the lung, which would indicate that treatment should be continued with rest until resolution has taken place.

The sedimentation rate should be watched during the course of the disease and will give definite information as to the time the patient should be discharged.

Oppenheimer[13] gives the following summary of roentgenotherapy for this disease:

1. Roentgenotherapy with small doses of between 35 and 90 roentgens resulted in clinical cure within a few days in 45 out of 56 cases of virus pneumonia.

2. The pulmonary consolidation disappeared within three to five days after roentgen treatment.

3. The results of roentgen therapy were best at early stages of virus pneumonia, but limited if irradiation was used later than two weeks after the onset of the disease.

4. Roentgen therapy was the most effective mode of treatment for control of the persistent cough which delayed complete recovery during convalescence in patients who had not received irradiation during the febrile state.

5. At early stages, the 4 doses applied should be small. Treatment with doses exceeding 100 roentgens during the early stages resulted in alarming systemic reaction. No untoward reactions whatever were observed with the use of small doses.

Correll and Cowan[14] report that in 23 patients given x-ray therapy within four days of admission, failure to respond to treatment occurred once. In the remainder the febrile period, total number of sick days, and days of resolution as proved by x-ray, were reduced roughly one-half.

In nine patients failing to resolve in 30 days on routine or other treatment, as evidence by radiological studies, seven cleared to x-ray within an average of four days following one or two roentgen treatments of 112 roentgen units each. Two failed to be benefited by x-ray treatment.

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Certain Supravital Microscopic Studies of the Heart

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This is a review of studies made by supravital methods of the hearts of normal and abnormal rabbits.

Rabbits were examined before anesthesia, during anesthesia before death; after death, and after removal of heart. All these 75 rabbits had been selected as controls, and were found to be normal.

Rabbits used: 10 aged 7 days; 25 aged 10 to 30 days; 15 aged 6 to 10 months; 10 aged 1 to 2 years; 15 aged 2 to 3 years.

NORMAL HEARTS

In each of these cases the heart was removed from the rabbit under surgical anesthesia; upper part of interventricular septum taken at once, while still beating, placed on chilled table of microtome, packed in dry ice. Freezing had begun on one side while heart was still beating on the other. Tissue was sectioned and examined immediately, without staining or fixing, the condition being practically that of living tissue. (Method was checked by use of unicellular organisms, which could be examined during life quite easily; also after same quick-freezing method.)

Microscopic examination of sections showed, in each case:

Cross striations even, regular;

Longitudinal striae rarely visible, very indistinct when visible at all;

Connective tissue fibers fine, delicate, scanty;

Nuclei of muscle cells placed midway between ends;

Striations not distinct near nuclei;

Arterioles containing central core of cells surrounded by peripheral zone of plasma (One hundred cross sections of arterioles were measured, and it was found that the sectional area of plasma was equal to the sectional area of the core of cells);

Capillaries containing plasma and very few blood cells; approximately one erythrocyte in capillary area long enough to contain 10 to 15 cells placed in line; no hemorrhagic areas anywhere visible.

OTHER NORMAL ANIMALS

Supravital slides from 26 other normal animals were examined for comparison with normal rabbits.

Animals used: 10 guinea pigs, aged 2 weeks, 2 months, 6 months, 1 year; 1 cat, aged about 2 years, pregnant and near time for delivery; 7 kittens, aged 2 days, 3 weeks, 6 weeks; 1 cat, aged about 2 years, male; 1 cat, aged about 3 years, female; 6 rats, white, aged 2 days, 2 weeks, 6 months. Two lamb hearts and 4 veal hearts from butchers were not supravital tissues, but were frozen and sectioned in same manner.

The same methods were used as described in report on rabbits. Tissue was taken in same way, from upper part of interventricular septum.

In each case, miscroscopic examination of supravital slides showed same conditions as those described for normal rabbits.

EARLY ATLAS LESIONS

Rabbits with atlas lesions present 1 to 20 days, but not longer, were used.

Rabbits used: 10 aged 7 days to 15 days; 10 aged 2 weeks to 5 weeks; 5 aged 2 months to 10 months; 10 of various ages, found lesioned accidentally.

The supravital method as described in case of normal heart was employed. Atlas lesion was produced by repeated gentle pressure on lower edge of right transverse process; atlas and occiput being held together to prevent occipital lesion. Axis and other cervical vertebrae were held together in the same manner. The lesion was a strain of the atlanto-axial articulation; there was none other palpable. Each of these accidental cases had been examined and found normal not more than 10 days before the lesion was discovered. No other lesion was palpable, in any case.

Microscopic examination of sections showed, in each case:

Cross striations, rarely some were irregular;

Longitudinal striae, rarely visible, always indistinct;

Arterioles, same as in normal sections;

Capillaries, same as in normal sections;

No hemorrhagic areas visible anywhere;

In each case, cells of the bundle of His showed early cloudy swelling in many areas.

LATER ATLAS LESIONS

The upper part of the interventricular septum of the heart was examined in 5 rabbits aged 4 months to one year with atlas lesion present 6 weeks to 10 months. Atlas lesion was produced as described for rabbits with early atlas lesions. Secondary lesion or deep muscular rigidity was present in each case, involving vaguely the first to the third or fourth or fifth thoracic spinal segments.

Microscopic examination of sections prepared by supravital method as described in case of normal heart, showed, in all these cases:

Cross striations irregular, often very dim;

Longitudinal striae very distinct in all areas;

Connective tissue fibers increased in amount, variously thickened; often in small knot-like masses, miscroscopic in size;

Nuclei often eccentric, occasionally placed near ends of muscle cells;

Arterioles crowded with blood cells; rarely thin layer of plasma visible;

Capillaries crowded with cells; rarely a small capillary area containing plasma only for distance not more than that of 2 erythrocytes in line;

Capillary hemorrhages many, minute in size, with erythrocytes occasionally showing degeneration;

Cells of bundle of His showing cloudy swelling in all areas.

NOTE: We were unable to determine whether these changes were due to prolonged effects of atlas lesion, or to effects of secondary lesion. Atlas lesion did not remain present longer than about 3 weeks without occurrence of secondary lesions (or rigidity) involving upper thoracic region, in this group of rabbits.

IMMEDIATE EFFECTS OF THIRD THORACIC LESION

Upper part of interventricular septum in 7 rabbits was examined by supravital method as described early in this paper.

Rabbits used: 2 aged 3 days; 3 aged 3 to 5 weeks; 1 aged 10 months; 1 aged 3 years; Each had normal history, each was examined before and during anesthesia, and in each a third thoracic lesion was produced during anesthesia (ether or ethyl chloride given gradually, no struggle). During the first hour thereafter the heart was removed and examined as previousy described.

In each case sections showed:

Cross striations even, regular;

Longitudinal striae rarely visible, always very dim;

Connective tissue fibers delicate, scanty, fine;

Nuclei of muscle cells centrally placed;

Arterioles fairly well filled with cells; peripheral plasma layer somewhat thinner than in normal heart, but variations irregular; satisfactory measurements of relative sectional areas impossible;

Capillaries containing many blood cells, about half the capillary area filled with erythrocytes;

No hemorrhages anywhere visible;

No visible changes in cells of bundle of His.

EARLY LESIONS OF THIRD THORACIC VERTEBRA

Upper part of interventricular septum, from 11 rabbits with lesion of third thoracic vertebra present 1 to 20 days, was examined.

Rabbits used: 3 aged 2 weeks; 5 aged 4 to 5 months; 3 aged 10 months.

On microscopic examination, sections showed:

Cross striations irregular, dim (conditions greater in rabbits with lesions longest present, in each factor);

Longitudinal striae distinct in all areas;

Connective tissue fibers fine, delicate, scanty;

Nuclei of muscle cells occasionally near ends of cell;

Arterioles crowded with cells; no peripheral plasma layer anywhere visible after lesion had been present 3 days or more.

Capillaries crowded with cells; diapedesis occasionally visible; few definite hemorrhages found, and in no case did the erythrocytes in hemorrhages show definite degenerative processes;

No visible changes in bundle of His;

Tissue fluids increased moderately; cardiac fibers somewhat separated by this excess fluid in many areas; cardiac cells seem to be somewhat swollen in many areas, especially noted in rabbits lesioned 2 weeks or more; occasionally excess fluids noted in earlier stages of lesioning.

LATER LESIONS OF THIRD THORACIC VERTEBRA

Upper part of interventricular septum of heart was examined by the same method.

Rabbits used: 3 aged 10 months; 5 aged 15 to 23 months. In each case a lesion of the third or fourth thoracic vertebra, or both, had been present 6 to 10 months.

Microscopic examination of sections showed:

Cross striations irregular and very dim;

Longitudinal striae distinct in all areas;

Connective tissue fibers abundant, often coarse and irregular in contour; occasionally small knot-like masses of connective tissue were found and these often were brownish (evidently stained with some derivative of hemoglobin).

Arterioles crowded with blood cells; walls of arterioles often irregularly thickened; no plasma layer anywhere visible;

Capillaries irregular in contour, crowded with blood cells, uneven in arrangement;

Hemorrhagic areas abundant, always very small, often visibly associated with capillaries the walls of which had been broken; erythrocytes often almost completely degenerated (these minute coagula often showed connective tissue overgrowth); other hemorrhagic areas showed cells in various stages of degeneration and absorption; brownish stain, evidently hemoglobin derivative, often found in coagula which were partly organized.

Cardiac fibers were usually separated by excess of tissue fluids.

TREATED RABBIT

One rabbit only could be used in this way, one 6 months old, with lesion of fourth thoracic vertebra of 4 months' duration. Treatment to correct lesion was given for 3 weeks, at end of which time lesion was not palpable, and it did not recur thereafter. No lesion was palpable in this rabbit for 2 months after last treatment. It was examined twice each week (except that twice unavoidable circumstances prevented the regular examination. No lesion was palpable thereafter).

Miscroscopic examination results:

In many cells, cross striations fairly normal;

Nuclei eccentric in many cells;

Longitudinal striae dim, and often not visible;

Connective fibers abundant, irregular in contour, often in minute, knot-like areas;

Arterioles contained more cells than were found in normal vessels, but in nearly all areas a visible peripheral plasma layer; this not even and regular, usually seemed thinner than in normal heart; walls of arterioles often thickened;

Capillaries contained approximately normal number of cells, with normal plasma areas; capillaries were often associated with the minute knot-like areas of connective tissue;

Hemorrhagic areas in which erythrocytes remained normal not found; hemorrhages with degenerated erythrocytes in various stages of digestion abundant;

Cardiac fibers separated by excess of fluid in a few areas.

PERMANENT SLIDES

Slides prepared by several different accepted histological methods showed the same findings so far as the conditions permitted. Delicate fluid changes were inevitably disturbed by the alternate dehydration and hydration, the fixing, staining and mounting necessary in the preparation of permanent slides.

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Review of Cardiac Pathology in Certain Laboratory Animals

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This study includes records of autopsies performed at the A. T. Still Research Institute Laboratories over a period of 5 years. Most of the work was done at Sunny Slope, some at the less extensive laboratories in Arcadia and South Pasadena. This review of cardiac conditions found in animals may add interest to reports of cardiac changes which have appeared in THE JOURNAL, and which represent the experiences of clinicians as well as of laboratory workers.

Records from Sunny Slope include findings from the hearts of 210 control and 90 lesioned rabbits, and of 27 weakly, deformed rabbits born of lesioned parents. During this 5 years, similar findings were reported for smaller groups of cats, rats and guinea pigs. In all experimental animals the lesions were produced by several different methods. However produced, a lesion affecting any given segment of the spinal cord of any animal was followed by similar pathological findings of the same viscera.

Routine examination of living experimental animals includes pulse count, and the palpation of the pulse and the heart beat. Routine autopsy includes gross examination of the heart. Microscopic examination of cardiac tissue is made in representative cases. Such routine examinations are employed whether the heart especially is being studied, or whether the animals are being used for studies of other tissues, or for controls.

Each control and each experimental animal was born of a family known to be normal for three or more generations. In this connection a "normal" ancestor has been examined at regular intervals, has produced two or more families of normal young, has never produced any abnormal young, and has never been found affected with any disease or by any accident.

Breeding animals, experimental animals and controls are examined at regular intervals. The appearance of the animal, the quality of its fur, its behavior, its posture, the color of the eyes and the visible mucous membranes, are all easily noted by inspection. The heart beat is counted, and palpable changes in the quality of the pulse noted. Reaction of the pupils to light changes, and of the breathing and the pulse to varying conditions of exercise and rest are also part of routine examinations. Costal or vertebral joint lesions and any changes in the quality of the spinal and other skeletal muscles are noted by palpation.

Any departure from the normal disqualifies an animal for breeding stock and for any group of controls. Unless the cause of an abnormal condition is definitely known, the animal showing it disqualifies its parents also for breeding stock. Disqualified animals can be used in the study of methods of technic and for certain preliminary tests, but they are not suitable for control or experimental or breeding animals.

Each of the 210 normal rabbits which was more than 6 months of age had been examined at regular intervals before death, the intervals varying according to the experiments for which the rabbit was being used as control, and had been found normal. In each case death was due to the same conditions used for the death of the experimental rabbits; these included overdoses of ethyl chloride, ether or chloroform (sometimes old chloroform), and inhalation of illuminating gas. Surgical procedures under anesthesia sometimes preceded death. In other cases a sharp blow upon the base of the skull caused death.

In each of these cases, the rabbit was examined for costal and vertebral joint lesions before and during anesthesia, and the spinal tissues were examined after death. In the control rabbits no costal or vertebral joint lesion was found. No abnormal visceral condition was found except such as might be due to anesthesia or surgery. In each case the heart presented the following conditions, used as criteria of normality:

(1) The heart beat remained strong and regular until affected by the cause of death.

(2) After removal from the body, the heart remained rounded and firm when placed on a flat surface.

(3) On palpation, the heart seemed firm and the myocardium in a condition of normal tone.

(4) On section, the valves showed normal structure. The myocardium bled slightly. Extravasated blood showed no granular appearance nor any brownish tinge. Blood within the ventricles might be coagulated if section of the heart was delayed for any considerable time after the death of the rabbit.

(5) The walls of the heart could not be torn except by considerable force, and when this was done, the fragments were still palpably strong and of normal tone.

The histological methods used and the findings on microscopic examination varied according to the cardiac area selected for examination, and this varied according to the experiments for which each group of rabbits was used as control. In each of the 32 cases in which microscopic examination was made, only normal structures were found.

The condition of the heart was noted in 90 rabbits with uncomplicated vertebral joint lesions. This group did not include any rabbit with secondary lesions or with any complicating disorder.

A second thoracic lesion alone was present in 19 cases. In 14 the heart presented no recognizable abnormal condition. In 2 of these microscopic examination was made, with findings normal. In 5 cases the heart seemed soft on palpation, and it lay rather flat on the table after removal. It was not easily torn. Fragments were palpably softer than normal, as if lacking normal tone. In one of these cases microscopic examination was made, with no abnormal findings. The slides were permanent and thus were subject to errors due to dehydration.

A third or fourth, or third and fourth, thoracic lesion was present in 26 rabbits. In each case the heart lay very flat on the table after removal. On section, the myocardium bled freely and the blood seemed somewhat granular in consistency and brownish in color. The myocardium was easily torn and the fragments were very soft and flabby; they were palpably somewhat granular in consistency.

Microscopic examination was made in 10 of these hearts. In each the slides showed evidences of congestion. Capillary hemorrhages were abundant. Striations were dim and less regular than normal. Connective tissue hyperplasia varied according to the time during which the lesion had been present.

A fourth and fifth thoracic lesion was present in 5 rabbits. The heart in each was like that found in rabbits with a lesion of the third or fourth thoracic.

Lesion of the fifth thoracic vertebra, alone, was found in 10 rabbits. In one case the heart was like that found in rabbits with the third or fourth thoracic lesion. In 9 cases the heart lay rather flat on the table after removal, and was somewhat softer than normal on palpation, but these conditions were less marked than in hearts from rabbits with third and fourth thoracic lesions.

In 4 rabbits a seventh thoracic lesion, alone, was present, in 2 an eighth thoracic alone, and in 16 an tenth thoracic alone. In these 22 rabbits, nutrition was affected; they were thin and apparently weaker than normal. In each case the heart was softer than normal on palpation and lay flat on the table. Microscopic examination of 3 of these hearts was made, using permanent slides. No abnormal findings were noted.

A lesion involving the first, second or third lumbar vertebra, or two or three of these, was found in 13 rabbits. Each of these rabbits was rather thin and seemed weaker than normal. In 5 cases the heart showed no abnormal condition on gross examination; in 2 of these there were no abnormal findings on microscopic examination. In 8 cases the heart lay flat on the table after removal, and seemed softer than normal on palpation. In 2 of these cases there were no abnormal findings on microscopic examinations of stained slides.

In 27 cases, weakly or deformed rabbits born of lesioned parents were examined at ages of 2 days to 3 weeks. In 4 cases no cardiac abnormality was noted. In 23 cases the heart was softer than normal on palpation, was very easily torn, and lay very flat on the table after removal and before injury. The torn fragments were soft and fragile. In 2 of these cases supravital, and in 3 cases, stained, slides were examined. No other evidence of pathology was found in the hearts which were not deformed.

In 6 cases deformed structure of the heart, its valves or its great vessels was found. In 3 cases the foramen ovale was present 7 days, 8 days, and 10 days, respectively, after birth. (In the rabbit this foramen closes normally at about the time of birth.) In 4 cases a peculiar thinning of the myocardium was found at the apex of the left ventricle; in one case the thinning affected the apices of both ventricles. In one case both auriculo-ventricular valves were bicuspid. Deformities of other viscera were present in each of the 6 rabbits. In all of the 27 young born of lesioned parents, deformities of visceral or skeletal structure, or both, were commonly present.

Of 10 kittens born of lesioned mothers, 2 showed open foramen ovale when killed at the age of about 3 weeks. Each of the 10 kittens showed developmental anomalies of other than cardiac viscera and of certain skeletal structures.

It has been noted in many cases, a few of which have been published, that lesions which affect the vagal centers of nerves are followed by marked changes in the rhythm of the heart beat. Attempts have been made to discover pathological conditions of the heart which might explain these rhythms. Aside from slight changes in the structure of the cells of the Purkinje system, not always recognizable, pathological changes in the myocardium have not yet been described. Further studies are being made. The facts that lesions of the upper cervical vertebrae are so frequently followed by secondary lesions of the upper ribs and the third and the fourth thoracic vertebrae, and that these cause myocardial changes already described, add to the difficulty of determining the pathological conditions of the heart caused by disturbances in the vagal innervation.

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